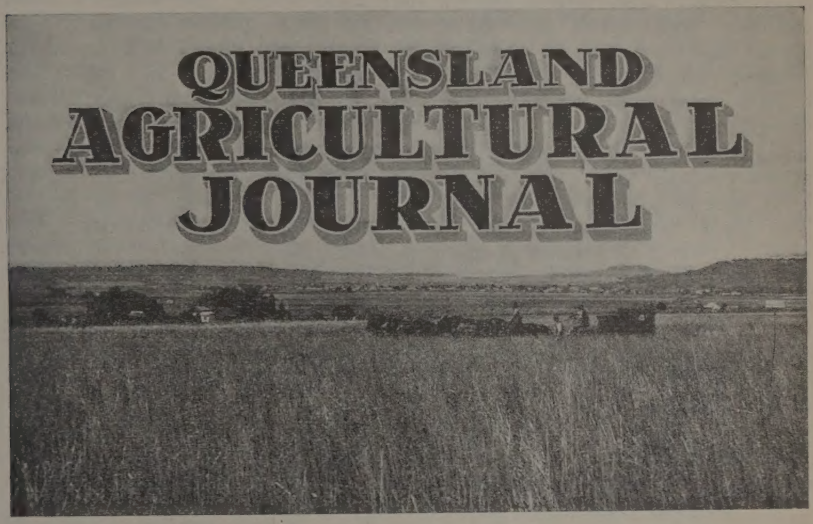
ANNUAL RATES OF SUBSCRIPTION.

Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling.** Members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.



VOL XLI. 1 JUNE, 1934. PART 6.

Event and Comment.

Carcass Competition—Export Meat Classes.

TO show producers their cattle, lambs, and pigs as dressed carcasses for export, a competition was conducted in the course of the month at the Brisbane Abattoir. It was the first competition of its kind in Australia. The idea at the back of it was to show the best type of cattle, lamb, and pig for the export trade. The competition attracted wide interest, and entries came from all parts of Queensland. There were 38 lots in the cattle section, comprising 380 beasts. They were of excellent quality, although some were over weight. The present demand is for smaller and quicker maturing animals. Although it is not the right season for lambs, the exhibits generally were excellent. The same tendency towards over weight was noticeable in the pig section. Nevertheless, the entries provided definite evidence why Queensland's export of pork has increased from almost zero three years ago to an important industry; and also why carcasses from the Brisbane Abattoir compete successfully with the products of other countries. The pigs included whites, middle whites, large whites, British blacks, Tamworths and Berkshires, and crosses of these breeds.

In opening the exposition on judging day, the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, said that it was interesting to recall that Queensland had more surplus meat for export than any other country in the British Empire. Despite all the talk of international agreements, quotas and restrictions, Queensland's meat industry was worth developing to an ever greater extent. The Meat Industry Board had had vision and had introduced a practice which would be of material benefit to Australia. From the experimental point of view, said the Minister, the lamb competition was the more important, and judging by the carcasses entered they had nothing to fear so far as the lamb industry is concerned. It had been stated recently that pork was the best exportable prospect for Queensland, and if they were able to build that trade up so much the better. The Meat Board was doing everything possible to foster the pork export trade. If producers did not utilise their by-products it would mean stagnation in the industry. The pig raising and exporting industry could be of great advantage to the dairy farmer in this respect. "We have a right to a share of the world markets, and the time is not far distant when that right will not be questioned as at the present time," remarked the Minister in concluding an able address on the Queensland Meat Industry.

Pure Milk Supply.

"THE idea seems essentially sound and the Council of the British Medical Association takes this opportunity of congratulating the Government upon a practical attempt to solve a difficult problem." This comment is contained in a statement issued by the Council of the British Medical Association in respect of the regulations recently gazetted on the subject of certified milk supplies.

For many years most medical men have felt that they could not safely advise the use of unboiled milk for infants and young children, notwithstanding the many advantages of raw milk. Previously, there was a feeling that the proposed legislation to improve the quality of the milk would have tended to the raising of its price, so that it could not have been available to poorer children in sufficient quantities. The present Ministry has devised a practical solution which should allow consumers to obtain a purer supply of milk at little or no increase in cost, and, at the same time, give dairymen who are prepared to supply it an advantage commensurate with their increased outlay. The Council of the British Medical Association has given careful consideration to the regulations, and has noted with satisfaction the two high qualities of milk which have been prescribed. But until this high standard is attained in the production of a pure raw milk, pasteurisation must be looked upon as our chief safeguard in establishing a pure and safe milk supply.

"Certified milk" which has to be cooled, bottled, and sealed immediately after milking and delivered in that condition to the consumer, would, no doubt, command a higher price than that ruling to-day, on account of the expense entailed in installing the necessary plant, but the consumer would be sure of obtaining a safe and pure milk especially suitable for consumption by infants in a raw state. Milk from a certified dairy, for which a similar bacteriological and chemical standard had been prescribed, should, however, be sold at the same general price as that operating at present. This quality of milk does not require to be bottled, but the consumer would know that the milk comes from a healthy

herd and from a hygienic dairy. This milk should be safe for consumption in a raw state by children and adults, and would be a great advance upon anything that has previously been obtainable.

The Medical Council is of the opinion that the dairyman who voluntarily produced "certified milk" or "milk from a certified dairy," should reap some reward for his enterprise and for the high quality of his milk, and is pleased to note that the householder may distinguish such dairymen by the designs on the milk vehicles: the vehicles painted white with a blue star for "certified milk" and with a blue band for "milk from a certified dairy." No other dairymen are permitted to use on their vehicles anything which resembles these designs. The scheme, although entirely voluntary, is calculated to overcome the two main difficulties to be encountered in improving the city's milk supply—the elimination of cattle affected by disease which might be conveyed to humans per medium of the milk, and the observance of scrupulous cleanliness in the dairy and in delivery to protect the milk from infection before it reaches the consumer.

The provision that all herds must be tested and remain under test, and all animals affected by disease destroyed, would possibly entail loss to the dairyman; but, on the other hand, no milk supply could be considered satisfactory until this has been done. Also, in either case, the standard of hygiene required in the dairy and among its employees must be considered as higher than that reached by most dairies at the present time.

Briefly the regulations provide, in the case of "certified milk," that such milk should be produced on premises especially approved for the purpose by the Department of Agriculture and Stock, and from a herd every animal of which has been certified free from disease. Such milk requires to be cooled to 45 deg. F. and bottled immediately on the premises. The bottles require the name of the producer and the date of production and the words "Certified Milk" on the closing disc. The bacteriological standard is a maximum of 30,000 micro-organisms to the cubic centimetre during the summer period, and 20,000 per c.c. during the winter months. In chemical composition, it requires to conform with the ordinary standard for milk. The regulations further provide for the effective sterilisation of bottles and equipment, the institution of hygienic measures in milking operations, such as the effective cleansing of the hands and the udders and teats of cows; while provision is also made to ensure the freedom from disease of employees. A stringent clause has been inserted to prevent misrepresentation, either by verbal statement or advertising matter, thus protecting both the consumer and the legitimately certified milk vendor.

In the case of "milk from a certified dairy," similar provisions are made, except that such milk does not require bottling, but might be delivered in cans under the system at present prevailing. This quality of milk, however, requires to be retailed direct by the producer.

The Medical Council is of the opinion that the improvement of the city's milk supply is now in the hands of the consuming public. Upon their insistence to be supplied with "certified milk" or "milk from a certified dairy" depended the success or failure of the scheme. It feels sure, however, that the public generally will appreciate the efforts of dairymen who are prepared to meet the additional expense and trouble in producing a safe high-quality milk.

Queensland Citrus Scale Insects and their Control.

By W. A. T. SUMMERVILLE, M.Sc., Assistant Entomologist.

(Continued from page 486.)

PINK WAX.

PINK Wax was originally described by Maskell in 1892 under the name *Ceroplastes rubens*. In a paper published in 1900 Green included the insect in the species *C. myricæ* Green, an error which he afterwards corrected, and all important references to the insect in Australian literature will be found under the correct name *Ceroplastes rubens*.

Description.

The active reddish coloured larvæ are rather more often observed than most other species, as they are somewhat more conspicuous on the green leaves than are most other species on the parts on which they are to be found. On settling down, the young quickly secrete a white covering. As development proceeds a band of red or pink wax appears below the margin of this white cap, and this band gradually increases in size. Soon the appearance is as follows:—The white cap has increased, particularly in height; below this all round is a red margin, about as wide as the cap is high, broken by eight white prominences, three on each side and one at each end, forming a series of rays. The scale of the adult female (Plate 140) is almost globular in shape and smooth, except at the top where a slight depression occurs, and towards the margins where there are two lobes on each side, the anterior one of which is well defined and prominent. Towards the base the wax may be produced to form a well-defined flange. The colour is deep pink, except at the apex where the white dot persists, though it may lose much of its whiteness, and at the sides where narrow bands of white mark the positions of the stigmata. These white lines vary in length, and extend well on to the smooth area. In crowded colonies the outline may be confined to the length of the lobes down which they run or may be considerably modified by pressure of one scale against the next.

The adult female is very soft bodied, and in the field it is difficult to remove all the wax without injuring the insect. Denuded, it is found to be hemispherical in shape, with a cavity beneath into which the eggs are deposited. The colour varies from pink to reddish brown, and the legs are very small. The length of the female scale is from one-eighth to one-sixth of an inch. The adult male has not been observed in Queensland.

Distribution and Habits.

Pink wax was probably introduced into Australia from Ceylon or some neighbouring country. It has been recorded from Ceylon, Japan, the Hawaiian Islands, and elsewhere. The species is very common in the coastal parts of Queensland, and extends well into the interior also. The list of host plants is very long, and it may be said that it is never surprising to find pink wax on any plant, other than those typical of dry climates (*Xerophytes*). It is particularly prevalent on trees growing along watercourses near the coast, and river cherry trees *Eugenia* spp.,

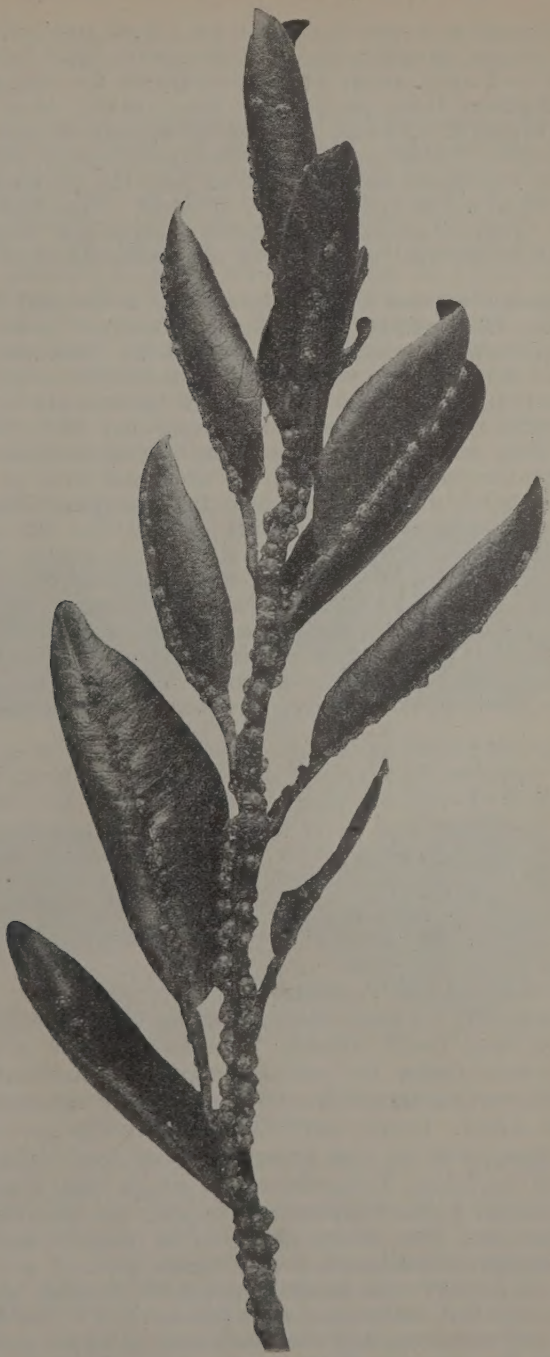


PLATE 140.

Pink Wax Scale, *Ceroplastes rubens* Maskell, showing infestation of leaves and twigs.

almost always carry enormous populations. Such trees, which have a deep green foliage, commonly appear almost totally black in consequence of the growth of sooty mould which accompanies the pink wax on the leaves. Indigenous trees, particularly river cherry, form a constant and prolific source of infestation from which the scale spreads to orchard trees. A number of other cultivated plants are attacked, but the insect is usually of importance only as a citrus pest, though mango, custard apple, and ferns are at times severely infested. Figs (cultivated and indigenous), guava, banana, pomegranate, pepperina, eucalypts, and Brassaia (Umbrella tree) are a few of the commonest host plants.

The eggs are encased beneath the scale in a concavity in the body of the female. On emerging, the young crawl around for a considerably longer time than do most species found on citrus. Observations on this point showed that the great majority of young do not settle down until at least three days after they emerge from beneath the mother. The period in which the distribution of the young may take place is correspondingly long and mechanical scattering is thus very effective. The most important means of dispersal is the wind, and trees, or portions of trees, exposed to the wind may be quickly infested from indigenous hosts considerable distances away. Thus it is usual for the tops of tall trees to become infested in the first place, and if the number of crawlers arriving in the orchard in this way is not very large the colonies may be confined to the few topmost branches. It is therefore the tops of trees which should be kept under observation in orchards which are free of the pest but which are liable to infestation. The pest may remain confined to the top branches for a considerable time, but usually the infestation spreads all over the tree when the following brood appears.

When settling down to feed the insects always select a position in which there is a plentiful supply of sap and where the tissue is very soft. Thus colonies are found only on leaves and tender twigs. On leaves the insects are usually confined to the midrib, or at least to one of the main veins (Plate 141). Both surfaces provide feeding areas, and citrus leaves are commonly found on which practically the whole of the midrib on both surfaces is hidden from view beneath the scales. Such leaves may carry over a hundred individual insects, and seventy on one side is not very uncommon.

As it is the most tender, freegrowing twigs which carry the colonies it is most frequently the wood which is bearing fruit, or which is to bear the following crop, that is affected. Though pink wax is not a particularly voracious feeder the numbers which are habitually present, together with the nature of the parts principally attacked, result in considerable injury. Leaves may be killed, but twigs succumb only in exceptional cases, and the most important direct result is the reduction in the size of the fruit. This reduction in size is often overlooked, but it has been shown to be very considerable. By reducing the vigour of affected twigs pink wax commonly paves the way for infestation by the more serious mussel scale. This forms part of a well-defined succession. A healthy tree becomes infested with pink wax, and the vigour is so impaired that mussel scale gains a hold. This leads to the destruction of small twigs and the weakening of larger ones. This in turn favours the entrance of melanose. Unchecked, the mussel and melanose together accomplish the death of larger twigs and branches,

and finally quite large limbs may succumb. The succession described is responsible for much of the dead wood which appears in otherwise healthy trees.

A further great objection to pink wax is that it always has associated with it a copious growth of sooty mould, and with no other scale occurring on citrus in the State is there nearly the same amount of this fungus. Heavily infested trees may present a uniform black appearance. Both surfaces may be covered completely by layers of fungus, and not only are the leaves so affected, but a proportion of the fruit may also be partially covered. Such trees may have more than 70 per cent. of the foliage effectively screened from the sunlight and practically every fruit somewhat blackened. The cutting off of the sunlight from the leaves is an important indirect effect of a heavy infestation by pink wax, for leaves so affected may be practically useless to the plant. It is, however, the fungus on the fruit that gives growers the greatest concern as a rule. The fruit must be cleansed before it can be marketed successfully, and though most of the black can be removed fairly easily by

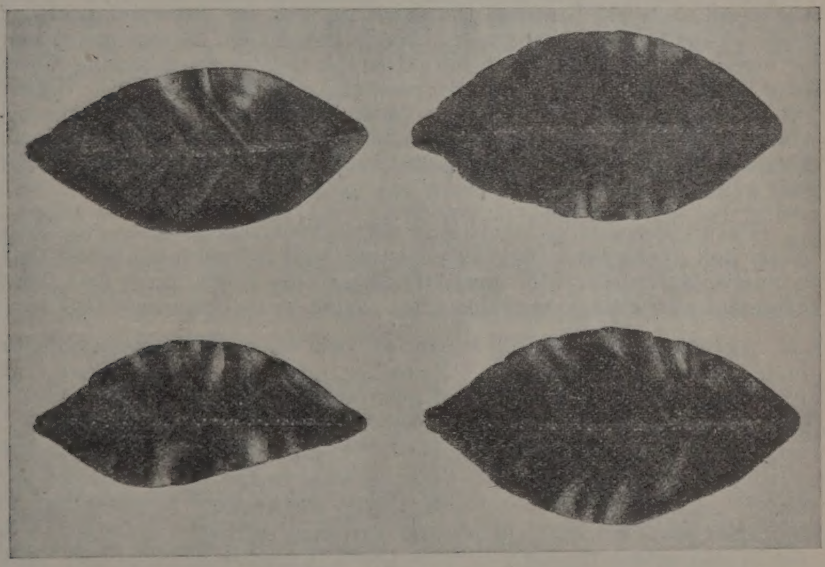


PLATE 141.
Pink Wax Scale, *Ceroplastes rubens* Maskell, showing young in correct stage for spraying.

brushing, the last traces often have to be washed off, particularly if the rind be at all rough. The Emperor of Canton mandarin, which is the variety most frequently calling for attention in this respect, is a soft fruit with a rind that is by no means smooth. As a general rule any attempt to remove the last residue of the fungus by extra use of a hard brush is likely to result in injury to the fruit. The pink wax and its associated growth of sooty mould are usually more in evidence in wetter seasons, and it is at such times as these that the common blue and green moulds cause most loss. A good deal of the loss through these rots is attributable to the handling the fruit receives before it leaves the

packing shed, and the removal of sooty mould by the use of dry brushes is particularly liable to cause injury to the rind at such times, thus facilitating the entry of the rot fungi. Washing in water containing borax is preferable at all times to brushing when large numbers of fruit have to be so treated, and in such circumstances as those discussed above dry brushing should never be employed.

Whilst all commercial varieties of citrus are susceptible to attack by pink wax, preference in this respect is very noticeable. In Queensland the pink wax is primarily a pest of the Emperor of Canton mandarin. It is grown extensively, and it is very rarely indeed that a tree of this variety does not harbour appreciable numbers of pink wax scales. Other mandarins are also favoured, particularly the Scarlet variety. Oranges, as a rule, are not greatly troubled by the pest, but Washington Navels, when young and very vigorous, frequently carry large populations. Seedling trees of the round orange type are also rather heavily infested at times. Lemons, on the other hand, are very seldom attacked, and it is uncommon to find even a few individuals on this species of citrus. The varietal preference is apparently dictated by the same urge which causes the insect to seek the favoured parts of trees. Thus even an Emperor of Canton tree which, on account of loss of vigour, is not carrying the usual supple tender fruit-bearing wood may be quite or almost free of the pest, and with all varieties the degree of infestation is dependent on the vigour of the tree. When favoured varieties growing in a position where infestation is probable do not become infested, it can be suspected at once that the health of the tree needs attention.

The incidence of pink wax is so closely bound up with the condition of the tree that even with indigenous plants it is sometimes found that a particular species will carry the scale only when there has been abundant new growth available when young scales were moving.

As high temperatures in coastal districts are usually associated with humid conditions and closely followed by rain, it is in such times that trees make their best growth, and thus pink wax increases noticeably at such times. In the interior parts, however, long periods of hot weather may occur without any appreciable fall of rain, and in these parts hot weather is commonly followed by a decrease in the populations of the insect. Long periods of low temperatures, on the other hand, appear to adversely affect the insect, and though mortality of insects in the winter is not at all marked, the early summer brood is usually much smaller than that in the late summer. Crawlers are not found in the coldest times, and therefore the effect of cold on the youngest stage has not been observed and is of no moment in Queensland. It will be seen by comparison that in many important characteristics pink wax may be directly contrasted with the red scale, and thus it is very unusual to find these two species on the same tree concurrently. Both species, however, may be found on the same tree in large numbers at times when a good spring has been followed by a long, dry summer. In such cases the pink wax is usually obviously distressed, and before control has to be established one or other of the species will usually not have to be considered. In years when the monsoonal rains are long delayed or very light, however, the control of both red and pink wax scales on the same tree may be required.

Life History.

Under normal conditions in the orchard there are two well-defined generations of pink wax each year. The times of commencement depend, of course, on a number of conditions and may vary a little. Generally the first brood following the winter may be expected to appear during November, but at times the main hatchings may be delayed until early December. December, January, and part of February, are passed in immature stages. Eggs are then again produced towards the end of February, or more typically early in March. No further broods occur until the following November. Each female may produce progeny over a period of about one month. When the weather remains very dry at about the normal time of reproduction, the appearance of the following generation may be delayed and hatchings then be spread over a longer period. That is to say, young are to be found over a longer period than usual, but this is due rather to variation in time of egg-laying by different individuals than to any very great prolongation of the period of fecundity of each female. Thus, when normal monsoonal rains are delayed the first female to reproduce may do so almost two months before the slower ones commence. This, fortunately, is not a common occurrence, for it is much more difficult to establish control under these circumstances than when young of approximately the same age are being combated.

On ferns and other such plants grown under artificial conditions the breeding of pink wax is sometimes affected, and irregular partial broods may be found. Growers are sometimes misled by the occurrence of such generations induced by the artificial conditions, and for the purpose of citrus growers only those trees outside the orchard which serve as sources of infestation need be considered. On these it will be found that there are the same number of broods as on citrus, but these broods may commence at slightly different times from those in the orchard. The variation, however, is slight and never of much consequence, except perhaps where irrigation is practised.

WHITE WAX.

White wax, *Ceroplastes destructor*, was described by Newstead in 1917. For many years the Queensland white wax scale was thought to be *Ceroplastes ceriferus* Anderson, and it is under this name that most of what has been published on the insect has appeared. During the course of investigations in New South Wales recently, however, Zeck[8] found that all the specimens he had from citrus were *Ceroplastes destructor* and not *C. ceriferus*. The evidence gained during the investigations now being recorded supports this conclusion, and though *C. ceriferus* occurs on a number of indigenous plants in Australia apparently it does not attack cultivated citrus.

Description.

The vernacular name aptly describes the appearance of the species (Plate 142). The young, on settling, are quickly covered by a waxy coating the margins of which are produced outwards in a series of arms or rays. The form soon changes, and the general shape is conical though the base may not be evenly rounded. As development proceeds the conical shape is lost and the scale becomes more or less globular in form, somewhat flattened on top, and with irregular protuberances on the sides. Colonies are typically so crowded that the outline of the individual

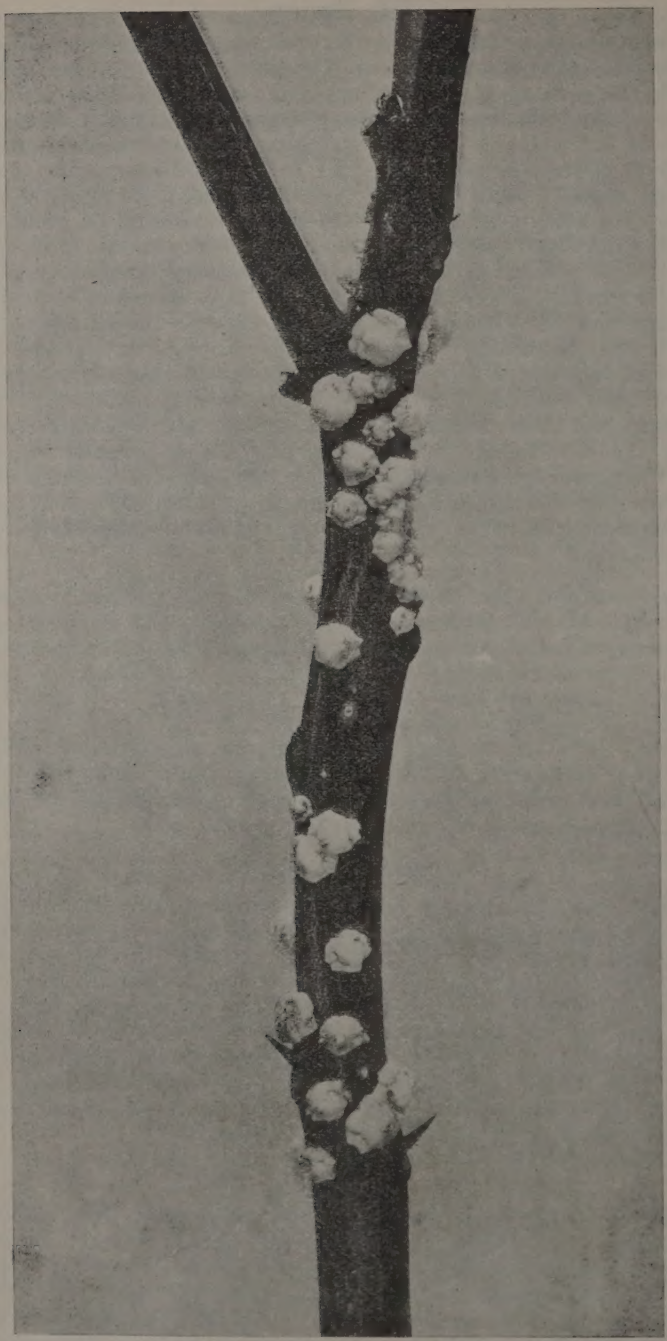


PLATE 142.

White Wax Scale, *Ceroplastes destructor* Newstead, showing infestation on small branch.

scales may be variously modified and the whole appear like a series of irregular masses of wax along the twig. The colour is at first white and rather shining, with a snow white line of flatter white marking the position of the stigmata. Later the general colour becomes duller, and old specimens may be almost grey. The male has not been observed in Queensland. The length of the scale of the female is three-eighths of an inch.

Distribution and Habits.

White wax scale was described from Uganda where it infests coffee, cocoa, Croton, and other plants. Zeck records it from more than twenty species of trees in New South Wales, and there is little doubt that most of those plants or allied species would be included in a complete list of hosts in Queensland. Little work has been done on this question in Queensland, and the only plants other than citrus from which the species can at present be definitely recorded are river cherry (*Eugenia* spp.), *Helichrysum diosmopholium*, Gardenia, persimon, and guava. The insects spread from these hosts to orchard trees, but it is seldom that white wax becomes a pest of commercial citrus in this State. It is more commonly found in orchards in coastal parts than in the interior. Even on the coast, however, it is usual to find only one or two trees in an orchard which carry more than a few individuals. Occasionally more general infestations do occur, both on the coast and further inland, and control measures have to be adopted, but the pest is nowhere as important in Queensland as it often becomes in New South Wales. Though the scale cannot be considered to be of more than minor importance in Queensland at the present time, there is some reason for thinking that its importance may be increasing. Certainly during the past twelve months more inquiries have been received concerning white wax than during any of the previous five years. This may be due to the influence of quite temporary factors causing an increase in populations, both in orchards and on uncultivated host plants, and it will possibly be found that the larger populations in orchards will not be maintained for any considerable period. Close observation of the position should be kept, however.

Life History.

Unfortunately, owing to the destruction of experimental trees by an outside agency the breeding work lacks the continuity necessary to enable a definite statement to be made. It appears, however, that there is but one generation each year. In 1932 large numbers of crawling young were found early in November. Young continued to emerge in large numbers throughout December. Those young which had emerged in November were used in the breeding work. By the following June a number of these were almost full grown in size, but the great majority were scarcely half that size. It was soon after this that the tree was destroyed. During July the greatest number of individuals observed in the orchards were approximately half grown, but late in that month (1933) a few females in one colony were found to be reproducing. Young were secured from these, but none survived to become established. No other young were found until the following November. Further young were observed in December and January.

It would appear then that normally there is but one generation each year commencing in November and December, or less typically early in

January. The occurrence of young in July was probably abnormal, and it would seem that mortality of crawlers at this time of the year is very high.

THE LONG TAILED MEALY BUG.

The long tailed mealy bug (*Pseudococcus longispinus* Targ.) was described by Targioni-Tozetti in 1867 under the name of *Dactylopius longispinus*. In much of the Australian literature the insect is referred to as *Dactylopius adonidum*, a name given it by Signoret in 1875. There are a number of other synonyms, but these are of little importance. The generic name *Dactylopius* is, however, now not applicable, and *Pseudococcus* is the correct name. In some recent literature this species is again referred to as *P. adonidum* the authority given being Linnaeus.

Description.

This mealy bug, like other members of its group of Coccidæ, does not remain stationary but wanders about the plant for the greatest part of its life. The insect is well described by the vernacular name. It is active, elongate oval in outline, and covered by a white mealy secretion. At the margins a series of filaments project well out from the sides of the body. At the posterior end are four filaments, two of which are noticeably longer than the body. It is unlikely that orchardists will confuse this insect with any other scale on citrus, but confusion occurs between this and the larvæ of the ladybird, *Cryptolæmus montrouzieri* Muls. The similarity, however, is not very marked. The ladybird larva is a flatter white in colour, and the projections from the sides of the body are much coarser in structure. The legs are stout and the jaws are prominent, whereas with the mealy bug the legs are slender and the mouth parts of the delicate sucking type. When observed together, as they commonly are, if the mealy bug be seen at all, the differences in general appearance are obvious, and only very young ladybird larvæ would be mistaken for the coccid. The length is one-sixth of an inch.

Distribution and Habits.

The long tailed mealy bug is widely distributed in tropical and semi-tropical countries, where it attacks a large number of plants. It also occurs in temperate countries, but in these regions it is usually a pest in hot houses.

The insect cannot be considered a pest of citrus in Queensland. Though it has been found in the Burrum, Gayndah, and Maroochy districts, it is seldom seen and never occurs in large numbers in orchards in this State. No injury attributable to this insect has been noticed in any orchard, and the insects are usually observed endeavouring to escape from the ladybird *C. montrouzieri*, or climbing the trunk of the tree when returning to the twigs after being removed by jarring.

Life History.

No work has been done in connection with the life history of this insect in Queensland.

COTTONY CUSHION SCALE.

The name *Icerya purchasi* was given to the cottony cushion scale by Maskell in 1878. Unlike many other species, there has been little or no confusion as to its true identity, and all references to the insect will be found under this name.

Description.

The scale is very distinctive in appearance, and there could scarcely be any confusion with any other species found on citrus. The rather flat young are dark-red in colour, and the body is covered with a yellowish or dirty creamy-coloured cottony secretion. Long delicate hairs are carried on the antennæ and at the anal end of the body. Soon after feeding has commenced four areas of callous-like formation are prominent on the dorsal surface, and similar smaller areas may be seen towards the margins. A long single hair projects from the anal end, and at the tip of this a droplet of clear liquid can generally be seen. The dark hairy antennæ and long legs are conspicuous. As they develop the females become somewhat convex, and the body, which is dark-red or reddish-brown in colour, is covered with a yellowish mealy matter. The body is adorned with a mass of minute hairs which imparts a rather woolly appearance to it. Long delicate filaments project from the margins. When about to produce eggs the adult female secretes an ovisac. This ovisac is composed of snow-white cottony material compressed together, and the exterior is distinctly and regularly corrugated. Ultimately the insect rests on the anterior end of this ovisac in an almost perpendicular position with the posterior end uppermost. The length of the female is one-quarter of an inch. The adult male is of the usual delicate form, but is rather larger than the males of most other citrus scale insects. It is orange in colour, and the wings are smoky.

Distribution and Habits.

Cottony cushion scale is thought to be native to Australia, but it is now distributed throughout the world. It has been recorded as having been particularly destructive in California, South Africa, and New Zealand. The insect attacks many plants, including wattle, rose, grape, figs, and several species of deciduous fruit trees. It is primarily as a pest of citrus that the insect has become widely known. It cannot be considered of any moment as a pest of citrus in Queensland, however, and is not a very common insect on any cultivated plant. It is more frequently brought to notice as damaging roses than for any other reason. Very few orchards in the State harbour the species, and infestations are usually small and generally confined to a few trees only. For the most part the scale feeds on the twigs, and the injury which a few individuals can cause in a short period makes it easily realised why the cottony cushion scale is so feared in other places. Unlike most of the scale insects on citrus, cottony cushion does not become fixed early in life, and the females are found moving about the plant until the time of reproduction.

That the insect is of so little significance in this country is due to a very great extent to the wonderful degree of control exercised by its natural enemies. If for any reason these natural enemies are temporarily absent from a locality the insect quickly asserts itself. Fortunately, however, such absences are very rare, and as both the coccid and its most effective natural enemies are native to the country, or at least have been here for a very long period, there is no reason for anticipating that the present status of the insect will change, and cottony cushion scale will almost certainly remain of very minor importance as a citrus insect in this State.

Life History.

The life history as recorded in what follows was compiled from data obtained from rather a small number of insects. It is very difficult to breed the insect under natural conditions, as the abundance of predators and parasites continually reduces the number from which significant data can be obtained. However, observations in the field support the evidence obtained in experimental work.

The winter is passed in immature stages. Ovisac formation may be commenced as early as the beginning of August, but large numbers of young are usually not observed until late in that month, or even early in September. The females of this brood reach maturity and reproduce again in November or December, most typically rather late in December. The second generation then making its appearance develops during the following three months. At this time of the year ovisac formation may begin about sixty days after emergence. During March a third brood is produced, the individuals of this being the parents of those young found in the following September. The time of appearance of the late summer brood appears to vary somewhat, and young may be found in February, March, or even early April.

SOOTY MOULD.

Sooty mould, fumigine, or black smut, as it is variously called, is so well known and so well described by the vernacular names that no further description is necessary. The tangled mass of hyphæ of the fungus, *Capnodium citri* Berk. and Desm., which produces this familiar black coating on leaves, twigs, and fruit is associated with several species of Queensland citrus scale insects. The fungus grows on a fluid secreted by the insects. This fluid, which is commonly termed honey dew, varies in nature and amount with different species, and thus, though commonly secreted by scale insects, it is only that of certain species which supports sooty mould. The fungus has no organic connection with the plant, but grows on the honey dew and is wholly supported by that fluid. This is fairly generally known by orchardists, and too often it is inferred from this that the tree suffers nothing on account of the presence of the fungus on the leaves and twigs. Leaves are able to function correctly only when they are exposed, and thus a leaf covered by sooty mould may become almost or quite useless to the plant. When the number of leaves so affected is large the reduction in effective leaf surface cannot be ignored.

The greatest objection which orchardists have to the fungus is that it often spreads over the surface of the fruit and thus makes it necessary to clean the fruit before marketing. This involves both extra time and labour, even when the amount of fungus on each fruit is small and can easily be removed by brushing. When the fruit are badly affected, however, the most severe brushing to which the fruit can be subjected without risk of injuring the rind is at most only partially effective. Injury to the rind is frequently followed by infection of the fruit by blue or green mould, and the fruit may thus be lost. A light brushing only should be used, and where this is not sufficiently effective, washing in warm water containing borax or similar disinfectant should be undertaken. A common method employed for the removal of sooty mould is to place the fruit in a barrel partially filled with sawdust and then rotate the barrel. The friction of the fruit against the sawdust acts as a brush. This method is effective, but has many objectionable features.

and care should be exercised when it is used. The commonest fault is to have too many fruit and too little sawdust in the barrel, thus allowing considerable jarring of the fruit. In any case, there is considerable jarring, and only the very firm fruit which is to be sold within a day or two of being cleaned should be treated in this way. The method has very little to commend it except that it is cheap.

The removal of sooty mould by spraying is sometimes undertaken, but it is only on very rare occasions that this should be contemplated. If for some reason it has been impracticable to establish control of the scale pest, it may be possible to obtain good results by spraying for the removal of the smut a little before the crop is to be harvested. This, however, should be used as an emergency only, and it must always be borne in mind that the scale is the pest and the sooty mould merely one of its ill-effects. The cause must be combated in all possible cases.

ANTS IN RELATION TO SCALE INSECTS.

As a general rule, ants will be found associated with colonies of scale insects. In most instances on citrus trees it is the small brown ant, *Pheidole* sp., which is found running about the scales. These ants are sometimes thought to attack the pests, but this is not so, and for the most part the ants are searching for honey dew. In some cases the ants incite the scales to secrete this fluid for their benefit. By removing the honey dew the ants do some good, for they thereby lessen the amount available to support sooty mould. This good, however, is often offset by the harm done in interfering with the work of natural enemies, many of which are minute wasps which would be disturbed in ovipositing or searching for suitable sites for oviposition. In some instances the ants are known to assist the scale insects by distributing them and actively protecting them. On the whole, ants in association with scale insects on citrus are either of little value or actually harmful.

NATURAL ENEMIES.

Queensland must be considered fortunate in respect to the natural enemies of the scale insects of citrus. The great majority of the parasites of citrus scales of proven outstanding value which would be expected to become acclimatised in Queensland orchards are well distributed throughout the State. Many of these natural enemies are indigenous to Australia, and for the most part the remainder have been imported without contemplated assistance and thus without expense. When the large sums of money expended by other countries in the importation of some of these useful insects is considered, the good fortune of this State is easily realised. Whilst it is possible that a number of other species of these enemies not yet found in Queensland would accomplish some good, on the whole there is little justification for expending any money on importing and establishing any of the known useful parasites of any Queensland citrus scales, with possibly one exception. It would appear that in the case of pink wax extended biological control by the introduction of parasites from other countries might be expected to meet with success.

Whilst little active assistance can be given the natural enemies of scale insects by the orchardist, it it within his power to make better use of these friendly insects than is frequently the case. In the first place, there is much needless destruction of these species, both by design and

incidentally. Upon thorough examination, colonies of scale insects are frequently found in which so many individuals are parasitised that any artificial control work would not only be wasted but would lead to the destruction of thousands of the useful species. For this and other reasons connected with control, it is advisable that orchardists acquire some knowledge of the most useful of the natural enemies of their scale pests.

The important natural enemies are of two kinds—namely, insects and fungi. Of the two, the insects are by far the more important in this State, and belong to the following groups:—Moths, ladybirds, lace wing flies, and chalcid wasps.

Moths.

There are a number of moths whose larvæ prey on the scale insects, but the only one which is at all common in most parts is *Catoblemma dubia* Butl. The adult of this moth (Plate 143, fig. 3) measures approximately three-quarters of an inch across the outspread wings. The forewings are brown, with the margin lighter and appearing rather bluish at times. The creamy white larvæ (Plate 143, fig. 1) work beneath a covering web in which are entangled the scales of insects devoured, and other débris. These scales may be so placed on the web that a cursory glance would not reveal any difference between the area where the larva is at work and any other part of the colony. The small brown pupa is enclosed in a cocoon of creamy webbing (Plate 143, fig. 2). *Catoblemma dubia* is a most important enemy of white louse (Plate 145) and circular black scales, and it is also commonly associated with pink wax. The moths appear to be more abundant in dry years than at other times, and in these dry periods remarkable results are sometimes achieved against the two first-mentioned pests. Normally, the grubs are most numerous towards the close of the summer, and thus it is advisable to examine colonies of the circular black scale before fumigating or spraying. As white louse spraying should not be undertaken until late in the winter, the full effects of the moth against this scale are usually apparent some time before artificial control is contemplated.

The remaining moths are similar in general respects to *C. dubia*, but are all of lesser importance. Of these a second species of *Catoblemma* at times effects very material control against species of soft scale in the more inland parts of the State. This is a new species which Dr. A. J. Turner proposes to describe as *C. trigonographa*. The pupæ of this species are enclosed in large, tough cocoons which are commonly found matted together in groups, and generally against the base of the tree at ground level.

Ladybirds.

The adult ladybirds are well known, and their worth commonly recognised. Unfortunately, the occurrence of a few destructive species misleads some growers to suspect other species. There is, however, no ladybird which attacks citrus in Queensland, and all species found on that plant should be protected. For the purpose of rough identification it may be said that all small members of the family and all those which are large and shining are useful. Confusion is sometimes caused by the occurrence on citrus of the beetle, *Monolepta rosæ* Blkb., a most destructive insect to many plants, including citrus. The elongate shape of this insect, however, readily separates it from the more rounded, or at least well proportioned, ladybirds. Though the adult ladybirds are well

PLATE 143.

Fig. 1, Larvæ of *Catoblemma dubia* Butl. feeding on scale insects. Natural size. Fig. 2, Pupa of *Catoblemma dubia* Butl. × 3. Fig. 3, Adult of *Catoblemma dubia* Butl. × 3. Fig. 4, Eggs of the green lace wing fly, *Chrysopa signata* Walk. × 3. Fig. 5, Larva of green lace wing fly × 5. Fig. 6, Adult green lace wing fly × 3.

known, the larvæ are not. These are elongate grub-like creatures, tapering somewhat towards the posterior end, and possessing well-developed legs. Most species are black, dark-brown, or greyish-blue, but the commonest of all, *Cryptolæmus montrouzieri* Muls., is covered with a flocculent white secretion (Plate (144, fig. 5). There is little likelihood of mistaking the larvæ for other insects, and a few minutes' observation will usually reveal just what the insect is doing on a plant. The eggs are laid on the leaves as a rule, in clusters of a dozen or more, and these clusters of cigar-shaped, light-yellow eggs are familiar to most orchardists.

Undoubtedly the most useful of all Queensland ladybirds is the red-headed species *C. montrouzieri*. This insect is common throughout the State, and is almost always to be found in large numbers in any orchard. The adult insect is elongate oval in shape, being about one-fifth of an inch in length. The general colour is black, and the head, thorax, and tips of the wing covers are salmon red. The upper surface is clothed with fine hairs. Its larva has been mentioned in the preceding paragraph. The scale insects most favoured by this species are cottony cushion, Pulvinaria, and the mealy bugs.

Two other very important species are *Rhizobius ventralis* (Er.) (Plate 144, fig. 6) and *Rodolia cardinalis* (Muls.), although of recent years the latter species has rarely been observed in any numbers. The first-mentioned species, *R. ventralis,* is commonly associated with pink wax and soft scales, and against these pests it does very fine work at times. The adult of *R. ventralis* is oval in shape, about one-eighth of an inch or less in length, with the wing covers shining black and covered with light-coloured hairs. The larva is black on the upper surface. *R. cardinalis* is a very small black beetle with red markings.

Another very common species is *Orcus australasiæ* Boisd. var. *nummeralis* Boisd. It is the larger metallic blue ladybird often found amongst colonies of scale, particularly the circular black. It appears, however, to accomplish very little in the way of effective reduction in numbers, even when many are working. The smaller metallic species very commonly observed on citrus is *Orcus chalybeus* (Boisd.). The female is green and the male blue. It is a most useful species.

Lace Wing Fly.

The green lace wing fly, *Chrysopa signata* Walk., is a very beneficial insect. The eggs (Plate 143, fig. 4), which are creamy white in colour, are mounted on stalks about half an inch long, and the clusters of a dozen or more eggs are found commonly on citrus leaves. The larvæ (Plate 143, fig. 5) are curious creatures, tapering towards both ends. They may be seen wandering about the colonies of scale insects with a mass of empty scales affixed to their backs, thus appearing like a mass of moving scale insects. When fully fed, cocoons are produced by these larvæ, and from these later the adult lace wing flies emerge. These adults (Plate 143, fig. 6) are delicate-bodied creatures possessing two pairs of fine, gauzy, many-veined wings of greenish hue.

Though *Chrysopa signata* attacks many species of scale, probably the best work is done against pink wax. Light infestations of pink wax may be removed, but in general the numbers of the host so greatly exceed those of the lace wing fly that little impression is made on the scale position.

PLATE 144

Fig. 1, *Tomocera californica* How. × 24. Fig. 2, *Aphelinus chrysomphali* Mercet × 24. Fig. 3, *Scutellista cyanea* Motsch × 24. Fig. 4, *Alesia frenata* Er. × 8. Fig. 5, Larva of *Cryptolæmus montrouzieri* Muls. × 6. Fig. 6, *Rhizobius ventralis* (Er.) × 8.

Chalcid Wasps.

The parasitic wasps of the family Chalcididæ are minute four-winged creatures, rarely exceeding one-twentieth of an inch in length, and are usually much smaller. In comparison with their size they are stoutly built, and have well-developed legs. The forewings are comparatively large. Only a small proportion are native to Australia, but large numbers have been imported accidentally from other countries.

The group contains some of the most important parasites of citrus scale insects. One of the most useful species is *Aphelinus chrysomphali* (Mercet) (Plate 144, fig. 2), the small yellow wasp with conspicuous dark eyes commonly to be seen running about colonies of red and circular black scales. The wasps are particularly abundant in the late summer, and at that time of the year are often so numerous that over 75 per cent. of the red and circular black scales in particular districts are destroyed by them. When, as sometimes happens, this wasp is associated with large numbers of two other chalcid wasps, *Tomocera californica* How. and *Coccophagus iris* Gir., infestations in which every fruit carries thousands of red scales may be completely removed within a few weeks. In addition to attacking the red and circular black scales, *A. chrysomphali* is commonly bred from white louse, but in no case observed has the wasp accomplished results against this species comparable with what has been mentioned in connection with the red scale. *T. californica* is more commonly bred from hemispherical than from any other species of scale. *Scutellista cyanea* Motsch (Plate 144, fig. 3) is one of the most important chalcid enemies of citrus scales. It is very commonly bred from the hemispherical scale, and if old adults of this species are upturned and examined, the whitish larvæ of *Scutellista* will frequently be found devouring the eggs. The adult is the blue hump-back wasp commonly found amongst colonies of this and related species of scale insects. One of the most important of all the chalcid parasites is *Aspidiotiphagus australiensis* Gir. This insect attacks mussel, white louse, and circular black scales, and accomplishes much good at times, more particularly against the mussel scale. This wasp, in emerging, cuts a small round emergence hole towards the posterior end of the mussel scale.

The female wasps of this family lay their eggs in or upon the body of the host scale insect, piercing the scale with their ovipositors in much the same way as the fruit fly inserts its eggs into a fruit. The position into which the eggs are placed and the number of eggs is often characteristic of the species. A grub-like larva emerges from the egg, and after feeding transforms to a pupa, from which the adult wasp is produced. The actual method of breeding varies in different species. Some chalcids, like *S. cyanea* as mentioned above, are predatory on the eggs, and are thus free-living. Others, such as *A. chrysomphali*, the yellow wasp enemy of red and other scales, prey on the body of the scale insect but remain free and feed from the outside though attached to the body of the host. Many others pass the whole of their lives, except the adult stage, entirely within the body of the host. The adults are usually short-lived, and subsist for the most part on sweet juices, such as honey dew.

All species are not equally efficacious even if present in equal numbers. Some, of course, would be expected to be more voracious than others, but apart from this the degree of destructiveness varies. Generally parasites of the scale insect select young individuals in which

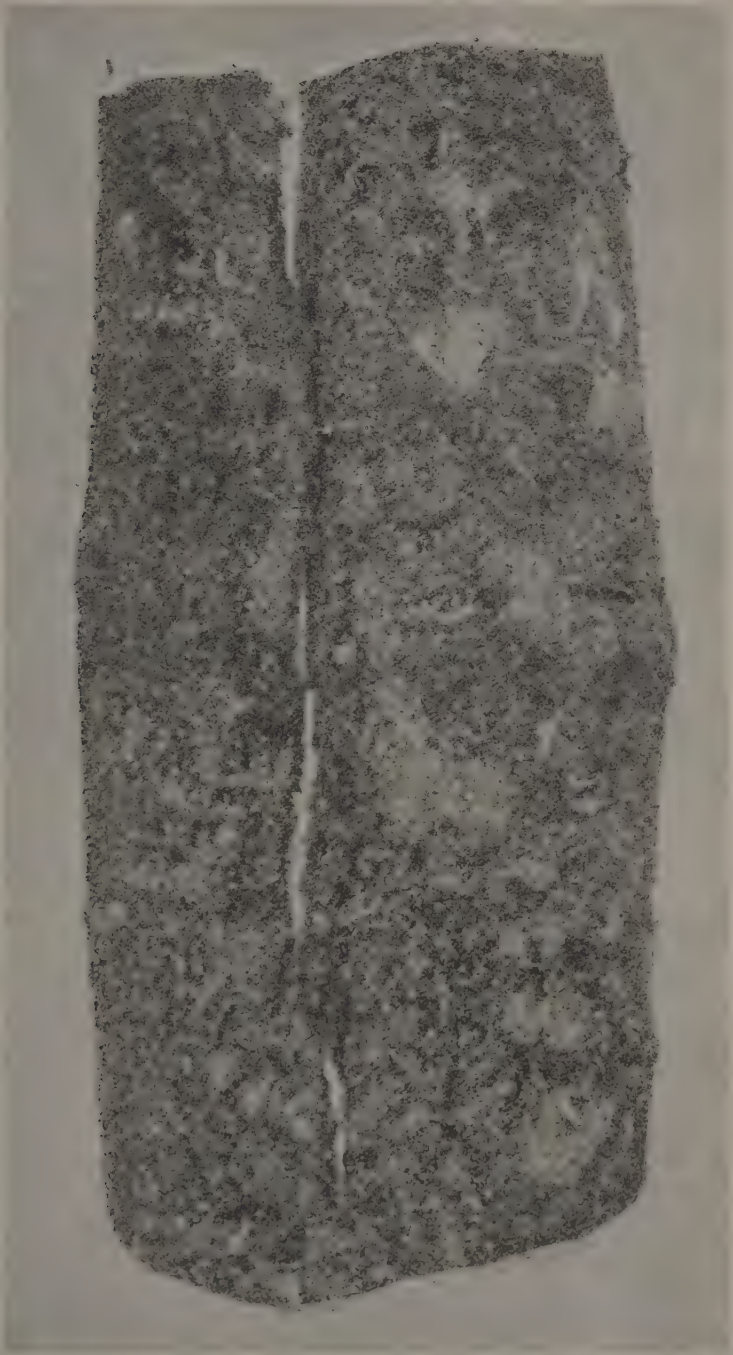


PLATE 145.

White Louse, *Chionaspis citri* Comstock, showing infestation on bark. Note predominance of males, presence of cocoons of predatory moth, and splitting of bark.

to oviposit, but in a number of cases those approaching maturity are preferred, which would, of course, be in the interest of efficiency in the case of those species feeding on eggs. In other cases it is found that the female of the scale is able to reproduce to a certain extent before death, owing to the lateness of the oviposition by the natural enemy. The rate at which a parasite develops may also be of importance, for obviously if a parasite reaches maturity very quickly in comparison with the host, there will be perhaps two or even more broods of the useful insect for each one of the harmful species.

When several species of chalcids select the one individual scale as a site for oviposition, it is possible that one or more of the species, instead of confining its attention to the scale, will prey on the other parasites present, and thus a certain degree of efficiency is lost.

Apart from such accidental hyperparasitism, there are many species of these wasps, termed secondary parasites, which are habitually enemies of other species of parasitic wasps. Thus, because a chalcid is found in a scale insect or bred from one, it does not necessarily follow that it is a useful species. The question of hyperparasitism, however, need not concern the orchardist, for if numerous wasps are found operating it must mean that parasites are present and that, in so far as the scales at any particular time are concerned, the position can be summed up without reference to the actual status of each insect.

In practice it is necessary to examine the individual scales and not merely observe the colonies as a whole and the adult wasps seen amongst the scales. With the aid of a hand lens immature parasites can usually be readily made out if of any age, and, commonly, parasitised scale insects show colour variations from the normal individuals. The small hole made in the scale, or the body of the soft species, by the adult parasite on emerging is usually readily seen without the aid of a lens.

Fungi.

Of the fungous enemies of scale insects in this State the red-headed fungus as *Sphærostilbe coccophila* Tul. is often styled, is by far the most commonly found. Though present in all the major citrus-producing districts, this fungus is usually of moment only in the more humid coastal parts. Even in these regions in normal times *Sphærostilbe* cannot be considered a very important factor in scale insect control. In February, 1930, in a large colony of red scale at Palmwoods over 70 per cent. of the individuals were found to be attacked by this fungus. At this time the fungus was much more in evidence than usual throughout the district, but this was a very outstanding case. In normal times 1 per cent. parasitism by this fungus of any host scales is seldom encountered. Red scale is the species most commonly attacked, and against this pest the value is considerably reduced by reason of its reactions to weather conditions being the opposite to those of its principal host. Thus when the scale increases the fungus decreases. It may be thought that the increase in scale is due to the decrease in fungus. Though this is probably so to a slight extent, the degree of control exercised in favourable periods does not suggest that the effect would be very pronounced if the fungus were entirely absent, and this, together with the habits of the scale, deduced from evidence from all parts of the State, suggests

that the increase is very largely independent of the fungus. Pink wax is also attacked by this fungus, and as pink wax infestations increase under circumstances generally found suitable for fungous development, it might be expected that an appreciable degree of control would be exercised in this case. This, however, is not the case, and the proportion of pink wax in any colony, either in the orchard or elsewhere, which is attacked is extremely low. The only fungus which has been found to be of much value in the control of citrus scales in this State is *Cephalosporium lecanii* Zimm. This is at times abundant, and is responsible for considerable reduction in colonies of soft scales. An undetermined species of *Podonectria* is sometimes found on mussel scale, but an appreciable degree of control of the insect rarely results. A species of *Ascheronia* attacks the hemispherical scale, causing it to become very hard and woody, and a species of *Septobasidium* is associated with mussel scale. A number of other fungi have been recorded as attacking scale insects in Australia, but these have not been found during the course of this investigation, and it would appear that they are of little or no importance in connection with scale insects of citrus.

Incidence of Natural Enemies.

Natural enemies, in common with most other insects, are not always present in equal proportions with respect to their hosts. In general, three main groups may be recognised:—

(1) Those natural enemies which are usually present in even proportions and are numerous enough to exercise a definite degree of control. Periods do occur in which insects in this group are rare, but marked fluctuations in populations are very exceptional. The red-headed ladybird, *C. montrouzieri*, is a typical member of this group, which includes most of the ladybirds. The temporary absence of these insects need cause growers no concern, and the situation is almost always rectified naturally within a very short period. In other cases, when an important species is absent for so long that the host scales increase appreciably, supplies of the enemy may usually be obtained from other districts.

(2) The second group contains those insects which annually build the population from small numbers up to a certain maximum. This group includes most of the hymenopterous parasites and the moth *C. dubia*. The latter insect, for example, is comparatively rare in the late winter and early spring. As the year progresses more and more individuals are found until at the end of summer the population may be very considerable, a drop occurring again during the winter months. In most cases the extent to which the useful insects are present is more or less proportional to the strength of the host colonies. This, however, is not an invariable rule. As the natural enemies of Queensland citrus scale insects are widely distributed and thoroughly acclimatised, little can be done to remedy any undesirable position with regard to the insects in this group, and for the most part any absence of a species known to have been in a particular district will be quite temporary.

(3) The third group includes those species which are normally present in small and, for the most part, negligible numbers, or which may generally be entirely absent, but on occasions arrive in very considerable numbers. Such species may at times do wonderful work,

though in general their value is very small. The outstanding example of this group is the ladybird *Alcsia frenata* Er. (Plate 144, fig. 4). This insect is ordinarily comparatively rare in citrus orchards, but at times the numbers become so great that the beetles may be seen in layers two or three deep in parts of the tree, and large trees may be so thickly covered that it is scarcely possible to insert the point of a pin between the insects anywhere on the plant. The group also includes a number of species of ladybirds and chalcid wasps.

These three groups are more or less well defined, but gradations will frequently be found.

The fluctuations in populations are brought about mainly by climatic influences or factors which are directly connected with climatic variations. For the most part the natural enemies of scale insects do not confine their attentions to one species of scale, but attack not only several species which feed on citrus, but other non-citrus feeding scales also. The natural enemies, of course, will follow the host scales wherever possible, and thus any abnormal happening such as the destruction of a large area of wild host plants of the scales attacked may be quickly reflected in the position in the orchard.

A list of the natural enemies observed during the course of this work will be found in Table I.

TABLE I.

Natural Enemy.	Most Favoured Hosts.	Remarks.
COCCINELLIDÆ OR LADYBIRDS.		
Cryptolæmus montrouzieri Muls.	Cottony cushion, Pulvinaria, and mealy bug	Probably the most useful scale insect enemy.
Rhizobius ventralis (Er.) ..	Pink wax, white wax, soft brown, and other soft species	A common and most important enemy of many species.
Orcus chalybeus (Boisd.) ..	Red scale and circular black	Common and very useful.
Orcus australasiæ Boisd. var *nummeralis* Boisd. ..	Circular black ..	Common but not generally very effective.
Scymnus notescens Blkb. ..	Pink wax	Very common and most useful.
Scymnus sp. (?)	Pink wax	Minute shining ladybird; very common and useful; may prove to be a *Rhizobius*.
Neda testudinaria Muls. ..	..	Not common.
Platyomus lividigaster Muls. ..	..	Common.
Serangium maculigerum Muls. ..	..	..
Rodolia cardinalis (Muls.) ..	Cottony cushion ..	Does excellent work when in numbers, but not very common.
Alesia frenata Er.	..	See note in text.
CHRYSOPIDÆ OR LACEWING FLIES.		
Chrysopa signata Butl. ..	Pink wax ..	Very good but not usually present in sufficient numbers to accomplish appreciable control.

Table I.—*continued.*

Natural Enemy.	Most Favoured Hosts.	Remarks.
Chalcidoidea or Chalcid Wasps.		
Aphelinus chrysomphali Mercet.	Red, circular black, and white louse	A most useful species.
Coccophagus iris Gir.	Red scale	..
Tomocera californica How. ..	Red, white wax, and hemispherical scales	Very common.
Rhopalencyrtoidea dubia Gir. ..	Red scale	..
Aspidiotiphagus australiensis Gir.	Red, circular black, pink wax, white louse, and mussel	A most useful parasite.
Metaphycus lounsburyi (How.). ..	Olive scale	Appears to be the parasite mainly responsible for the unimportance of this scale.
Metaphycus flavus How. ..	Soft brown	..
Metaphycus varia Gir.	Pink wax and Pulvinaria	..
Aphycus verdini Gir. ..	Soft brown	..
Cheiloneurus sp.	..	Probably a secondary parasite.
Diversineurus elegans Silvestri ..	..	Secondary parasite commonly bred from hemispherical scale colonies.
Parœnasomyia listzi Gir. ...	..	Secondary parasite. Recorded from *S. cyanea* and *T. californica.*
Aphelinus sp.	Soft brown	..
Marietta distonata Gir. ...	..	Thought to be secondary parasite.
Ophelosia crawfordi Riley ..	Cottony cushion ..	..
Coccophagus sp.	White louse	Not common.
Eucomys sp.	Soft scale	Possibly primary parasite.
Tæniomastix abnormis Gir. ..	Pulvinaria	Not common.
Signophora perpauca Gir. ..	..	Secondary parasite obtained from Pulvinaria.
Scutellista cyanea Motsch. ..	Hemispherical and olive scales	An important enemy of these species.
Encyrtis spp.	..	A large number of species, many apparently undescribed, of this genus were obtained, but the exact status of each not determined. Probably many are secondary parasites.
Noctuidæ or Moths.		
Catoblemma dubia Butl. ..	White louse, circular black and red scales	A most important enemy of the first-named scale.
Catoblemma sp.	Soft brown	..
Fungi.		
Sphærostilbe coccophila Tul. ..	Red and mussel scales	*See* note in text.
Microcera sp.	Pink wax	*See* note in text.
Cephalosporium lecanii Zimm. ..	Soft scales	*See* note in text.
Podonectria sp.	Mussel scale	..
Septobasidium sp.	Mussel scale	..
Ascheronia sp.	Hemispherical scale ..	Fairly common, but of doubtful value as only old individuals appear to carry the fungus to any extent.

ATTENTION TO FACTORS LIMITING INCIDENCE OF SPECIES.

The control of a pest in a commercial orchard may entail much more than killing a large percentage of the pest present at a particular time. Economic considerations demand that the trees remain commercially free of the pest for the longest possible period. With insects such as those now under discussion, which produce rapidly and prolifically, the most effective insecticide may accomplish little towards true control of the pest. In the case of red scale, for example, orchards have been seen in which repeated application of the best known scalicide for the purpose have failed to maintain a control of the pest for more than a few weeks, and where, had the problem been approached from the point of view of the trees, the insect could have been reduced to insignificance in a very short time. The application of scalicides, even at appropriate times, does not constitute the whole of the combative work which can be done against scale insects, and, in fact, in some cases may not form a necessary part of that work.

Growers have always found, and will continue to do so, that the same treatment does not give equally good results against a pest on every orchard or in every year. The explanation of this inconsistency is frequently to be accounted for by the habits of the pest, and not, as is very commonly assumed by orchardists, by variations in the insecticidal materials. If the habits of the various species of scale insect are studied it will be seen that each one thrives under certain circumstances and is of little or no importance under others. Some of these conditions are fixed or cannot be altered at will, but with others the influence can be minimised or magnified to some extent by the grower as he may himself desire. The extent to which a knowledge of the factors can be used in the control of scale insects is rarely recognised, and the first recommendation for the control of all scale pests is for orchardists to become familiar with the habits of the insect and thus be in a position to offset as far as possible influences which tend to increase populations of the pest and assist or create those which discourage the insects.

The nature and manner of working of outstanding factors are included in the discussion on the control of each species, but it is impracticable to include all. The way in which the knowledge of the habits may be applied varies from orchard to orchard, and cannot be dealt with in detail. At all events, growers are in the best position to decide the details of how they will proceed to obtain the desired objective, which is to minimise the number of scale insects which they will have to combat actively by reducing the probability of infestation. It may be a matter of judicious pruning, application of fertilizer, irrigation practice, drainage, or any other point having bearing on the health of the trees. For example, it is known that red scale multiplies most prolifically in hot, dry times, and it is desirable to establish artificial control as late in the summer as possible. When the normal monsoonal rains occur, the application of control measures for this species may be left until late March or even early April. If, however, the rains are delayed or are very light the pest may increase so much that the trees begin to suffer. At times growers fumigate at once to save the trees, only to find that,

owing to the period still elapsing before breeding appreciably slackens, the trees are not commercially clean at harvesting time. However, it has been shown exeperimentally that by extra watering not only are the trees better fitted to carry the scale population but that its rate of increase can be definitely lowered. Thus the control can be delayed until the correct time and a reasonably permanent commercial freedom from the pest established without any great detriment to the trees.

The point to be remembered is that scalicides are often only complementary and not sole methods of combating scale insects.

[TO BE CONTINUED.]

A Blowfly Specific.

A PREPARATION of this description should be an antiseptic as well as a healing agent, and afford some protection to the sheep or lambs, to prevent maggots developing from a future strike. Apart from this, there are the wool scourer and manufacturer to be considered, for much trouble, inconvenience, and actual loss is incurred if the specific applied cannot be scoured out successfully. With a view of coming somewhere near these combined qualities with a mixture fairly reasonable in price, the following is recommended for use:—

Ingredients.

40 per cent. Shell Dieselene Oil or Vacuum 28-38 fuel oil;

55 per cent. herring or cod oil;

5 per cent. cresylic acid;

0.1 sodium arsenite, or 1 lb. to 100 gallons.

For the convenience of making 5 gallons of the mixture, take 22 pints cod oil, 16 pints fuel oil (not more than 875 specific gravity), 2 pints cresylic acid and 1 oz. sodium arsenite.

To Mix.

Place the 22 pints of cod oil in a 5-gallon drum and add the 1 oz. sodium arsenite; shake well, then add the cresylic acid and fuel oil. Should the weather be cold, heat at least some of the cod oil and add the sodium arsenite; shake well, and add the other ingredients as above.

The mixture should be well shaken before using, and shaken up occasionally while in use, and applied with a brush or swab.

The conditions under which the ingredients were purchased allowed the specific to be sold, including the container and freight, at 3s. per gallon.—JAS. CAREW, Senior Instructor in Sheep and Wool.

The Soil Population.*

By H. W. KERR.

A CAREFUL examination of a Queensland cane soil immediately reveals its essentially mineral character. It would be found on analysis that at least 90 per cent. of the dry mass of any such soil consists of disintegrated and decomposed rock minerals, while in most cases this proportion would rise to 95 per cent. However, were a soil nothing more than the altered remains of some ancient rock, it would be quite worthless agriculturally. Such a lifeless, inert mass is entirely incapable of supporting crop growth, and we find that the fertility of the soil is intimately associated with that small residue—some 5 or 10 per cent.—which is not of mineral but of organic origin.

From the earliest times this fact has been appreciated by agriculturists. The earliest writings of which we have record stress the necessity for working into the land farmyard manure or other decomposing crop residues in order to increase its fertility. However, the true function and behaviour of these materials in the soil presented a problem the solution of which was discovered only in very recent times. It was in 1877 that two famous French chemists first demonstrated the manner in which nitrogen is made available to the crop in the form of nitrate; they proved conclusively that this process is effected by a select group of minute organisms which inhabit the soil, and their researches provided the stimulus for a most intensive study of similar reactions which take place in the soil. In the short space of the ten years 1880 to 1890, many new facts were brought to light, which demonstrated most convincingly that the soil possesses its peculiar population of minute organisms; and the work of more recent times has provided us with a clearer picture of their life processes, and the important part they play in soil fertility and crop nutrition. It is the purpose of this paper to trace briefly the manner in which these organisms obtain and consume their food, and the nature of the by-products of their work. Doubtless this subject provides one of the most fascinating chapters of the romance of the soil; and it is one of much greater importance to the agriculturist than is generally supposed.

THE SOIL BACTERIA.

When one speaks of bacteria or fungi, the lay mind immediately conjures up visions of dread diseases of man, beast, or plant, in their many and sinister forms. Yet the number of micro-organisms responsible for visitations of this nature constitutes, fortunately, a very small minority; and by far the greater number of "microbes," as they are popularly known, are the friends of man; they are ever busy in his service, destroying the waste remains of animal and plant life, and without whose aid the earth would be so littered with the corpses and plant remains of bygone centuries that life as we know it would be quite impossible. The soil is the native habitat of these helpful types. To give some idea of their widespread nature and the immensity of their number, it may be stated that a teaspoonful of rich garden loam contains as many as 100,000,000 of bacteria! Yet each is so minute

* Reprinted by permission from Proceedings of the Fifth Annual Conference of the Queensland Society of Sugar Cane Technologists, Cairns, March, 1934.

that when magnified 1,000 times it appears only as a small sphere or rod which is just clearly discernible, and the myriads of these tiny forms of life to be found in an acre of such a soil would weigh a mere 50 lb.

The soil bacteria have been the subject of intensive study for the past fifty years, and it is now known that they are extremely varied both in detailed form and in the nature of the work which they perform. It should be stated, from the outset, that we are not at all interested in their individual shapes or sizes, or in the bewildering names under which they labour. We are interested only in their work, and the relationship of this work to the soil and crop. Suffice it to say that the bacteria constitute the simplest forms of life. Whereas the "bodies" of the higher plants and animals are built up of numerous tissues, each composed of its many individual cells, the bacterium is a "single-cell" individual. That is to say, this organism, composed of one simple cell, is able to perform the essential functions of life for which the tissues and organs of higher forms of life are so specialised. Reproduction is effected by the simple expedient first of elongation of the cell, after which it divides in the centre to produce two individuals. The speed with which bacteria may thus increase in numbers, under favourable conditions, is truly amazing. The entire process of cell division, as it is called, may occupy only a brief half hour, so that if the process were repeated over a period of fifteen hours, it is possible for a single cell to give rise to 1,000,000,000 individuals! It will be evident that natural conditions never allow such excessive multiplication; but this calculation demonstrates how the numbers of active individuals may grow when food supply and other growth conditions are suitable.

FOOD SUPPLY.

It is a difficult matter to decide whether bacteria should be regarded as plants or animals; they possess habits which might cause them to be placed in either category, but they are usually regarded as resembling rather the plant kingdom. We will, therefore, look upon each bacterium as a minute plant, and study its life functions in some detail. Like the higher plants, they must have food for their growth and reproduction; but whereas green plants are able to manufacture their own foods—that is, sugars, starches, proteins, and so on—bacteria are entirely dependent on an outside source for their needs. It is in this respect that we find them of special interest, for they derive their food from the plant and animal residues which find their way to the soil, and it is this process of "decay" or decomposition which we should clearly understand, if we would appreciate the true benefits derived from the work of the soil population.

Now, these plant and animal remains are decidedly complex in their make-up. As the bacterium possesses no internal digestive system, how is it able to deal with the substances contained in the organic matter? Obviously, the food must be brought into solution before it can be absorbed through the delicate cell-wall which surrounds the organism. In point of fact, this is accomplished by the secretion of special "digestive juices" which are able to attack and dissolve the organic matter. Furthermore, all groups of bacteria are not capable of dealing with the same classes of substances, just as we find that the higher animals for example, are specialised in their food requirements.

DECOMPOSITION OF GREEN MANURE AND TRASH.

As regards the simple sugars—which are readily soluble in water—we find that they are suitable sources of food for almost all types; but as the composition of the organic substances becomes more and more complex, the specialised behaviour of the respective groups of micro-organisms becomes more clearly defined. These facts have a most important bearing on the mode of organic decay in the soil, and to illustrate the point let us consider the decomposition of, firstly, a crop of legumes, and secondly, of a mass of cane trash ploughed into the land. If the green manure crop be turned under when in a succulent condition, it presents a most favourable source of food. The sugars in which it abounds are eagerly devoured by the many soil organisms; the starches and proteins which constitute the bulk of the remainder offer but little resistance to decomposition and the soil population undergoes rapid multiplication due to the favourable food conditions presented. As a consequence, the heavy mass of green matter almost completely disappears in the course of three or four weeks; the only visible remains are the relatively small amounts of woody stems which offer stouter resistance to decomposition, but they eventually break down also under the persistent attack of specialised groups of organisms.

Consider now what happens when a mass of dry trash is ploughed under. This material is notably deficient in the readily "digested" sugars and starches, and is composed to a great extent of the more complex and resistant compounds, whose decay is far less complete, over a given period. There is another point of dissimilarity between these two sources of bacterial food. Like all plants, the bacteria demand a supply of available nutrients (or *plantfoods* as they are often called), if they are to grow and function successfully. As far as possible the bacteria derive their nutrients from the organic matter on which they feed, and with the succulent bean or pea crop they are abundantly provided for in this respect. Trash, on the other hand, is far from favourable, and it must be regarded as a highly "unbalanced" food; naturally, then, the bacteria must seek elsewhere in order to make up the deficit in plantfoods, and they turn to the available supply of the soil. It is usually found that nitrogen and phosphate are in greatest demand, which explains why an application of these nutrients in the available condition (for example, as sulphate of ammonia and superphosphate) effects a marked stimulus in the speed of rotting of a compost heap of moist trash.

It is evident that the trash decomposition will thus result in a temporary depletion of the soil's nutrient supply, and this provides a ready explanation of the oft-experienced fact that the ploughing under of a mass of cane crop residues induces most unfavourable growth conditions for our economic crop, while the rotting is in progress. Eventually, however, the nutrients absorbed in the process, together with those contained in the trash originally, become available once again for crop nutrition; but the temporary evil effects may be most serious, when, for example, the trash from a crop of plant cane is ploughed under at ratooning time. The practice is a bad one, particularly in dry areas, as the rotting process also depletes the soil moisture supply. It is much better to put the trash to good use in the form of a soil mulch, to complete a measure of its rotting on the land surface during the wet season; and when the ratoon stubble is eventually ploughed out, the process is completed in the soil while the land is in

fallow. That a green manure crop ploughed under at this time speeds up the rate of decomposition, is explained by the fact that the legume provides an abundance of available nitrogen for the bacteria which perform the work.

It is thus evident that the nature of the reactions which the soil bacteria carry out depends to a very large extent on the nature of their food supply. But in any case, the net effect of their labours is to reduce plant and animal remains to the simplest state. The end products are largely carbonic acid gas and water, while in the decomposition process the soil nutrients such as nitrogen, phosphate, lime, and potash, are again released and made available for crop nutrition. This in itself is a most commendable service which should earn for the soil population the lasting gratitude of the agriculturist. But there is a further aspect to this process of decay which is of even greater importance in that it confers more lasting benefits on the land.

SOIL HUMUS.

It was stated that most plant and animal tissues eventually succumb to the sustained attack of the "digestive juices" secreted by one or another group of soil bacteria. It should now be added that one peculiar class of plant substance is, however, able to withstand this onslaught in a large measure, and emerges from the attack with but slight modification to its original state. These interesting substances are known as *lignins*, and they constitute a large proportion of the "woody" parts of plants. As the result of the operations of the soil organisms, the original identity of these tissues is definitely altered, and they emerge as dark-coloured compounds, collectively and popularly known as *humus*. It is scarcely necessary to stress the value of this compound, and its influence on the chemical and physical properties of the soil. It is this substance which is largely responsible for that favourable granular soil structure so characteristic of a rich garden loam; it exercises a profound influence on the moisture-holding capacity of the soil, and confers on the land a marked degree of drought resistance. Whereas a sandy soil is capable of retaining about one-sixth of its weight of moisture, humus is able to hold twice its weight of water. A soil rich in humus does not pack readily in times of heavy rainfall, and a subsequent light cultivation usually suffices to restore it once more to a condition of good tilth. It possesses the power of holding large amounts of plantfoods in a readily available state, in addition to the fact that practically the *entire* nitrogen supply of the soil is a constituent part of the humus*, from which condition it is made available to our economic crop, through the process of slow decomposition effected by the soil bacteria. It is for this reason that a mass of decayed rock minerals cannot support plant life—it is totally devoid of nitrogen, an essential plantfood material.

When the above properties of humus are carefully reviewed, there is no agriculturist who would not agree that this is far and away the most important soil constituent; and it is particularly unfortunate that our Queensland cane soils are extremely deficient in this compound.

* Strictly speaking, this statement applies to the entire organic matter supply of the soil, and not alone to the more specific class of compound defined above as *humus*.

The reason is not difficult to determine. Our coastal areas are notable for their uniformly high temperature conditions, together with an abundant rainfall. This combination of factors entirely favours the rapid and complete decomposition of organic matter in the soil. Moreover, high annual rainfall also promotes a rapid removal of plantfoods, one of which in particular—that is, *lime*—is of very great importance in fixing the humus in the soil. When this nutrient is lacking, the humus is freely carried away in the drainage waters. This is amply demonstrated by the brown-coloured waters so commonly observed in many of the creeks and swamps of our poorer coastal forest lands.

Under these conditions it is evident that the problem of maintaining the organic matter content of the soil is a serious one, and is associated in no small measure with the rapid decline in fertility which so commonly follows the breaking up of our cane lands. The process of intensive cultivation which accompanies cane production is most favourable in its influence on the rapid depletion of humus. The growing crop profits from the latter process, but it is effected at great expense to the land. It has been stressed repeatedly that green manuring once in four years cannot be expected to contribute markedly to the permanent supply of soil organic matter, valuable though the practice is from other standpoints. The rapid and relatively complete decomposition of a succulent leguminous crop results in the production of but little humus, owing to the low proportion of lignins in its makeup. The only substances available to the cane grower to help him in his difficulty are the residues of the cane crop itself—that is, the oft-abused tops and trash which, in a wet harvesting season at least, are regarded simply as an unmitigated nuisance. The slow and incomplete decay of this material in the soil is a distinct advantage in this respect, and owing to its relatively high lignin content, a reasonable proportion of humus results. Even the consistent conservation of all available trash over a period of, say, twenty years, however, cannot be expected to enrich the soil permanently to the extent of more than 1 or 2 per cent. of humus. But what an improvement this would effect on many of our run-down soils!

OTHER SOIL ORGANISMS.

So much, then, for a brief and totally inadequate description of the economy and life work of certain of the soil bacteria. Nothing has been said of those specialised forms whose duty it is to convert ammonia to nitrates; or of those busy little organisms which are able to abstract the nitrogen gas from the atmosphere, and build it up into forms of nitrogenous compounds which ultimately become available for crop nutrition; or of the species which enters the roots of leguminous plants, where it obtains its supply of sugars for growth, providing in return nitrogen for the requirements of the host plant, the two living in a state of perfect harmony and co-operation. Again, there are those harmful groups of bacteria which thrive in water-logged soils only, and produce compounds which are in the nature of poisons to our economic plants, and dissipate the nitrogen supply of the land. We have said nothing as yet of the fungi, the yeasts, the protozoa which consume living bacteria, and of other minute soil organisms which also play a most important part in the processes of decomposition. Indeed, many of the reactions which have been credited to the labours of the bacteria are in reality the work of these associated forms. However, sufficient has been said to indicate that the "social organisation" of the soil

population is quite as complex as that of the human race. They lead a quiet existence in a state of peaceful contentment while the soil is in its normal state. True, the relative numbers of each class vary considerably with variations in local conditions; but the economy of the entire population is rudely disturbed when a lavish supply of available food is suddenly turned over to them. If it should be, for instance, an application of molasses or other highly available food, the fungi first increase in numbers at a tremendous rate, and permeate the soil mass with their downy, thread-like bodies; as suddenly, the food supply is finally consumed, and wholesale destruction of the fungi results. Their body tissues now serve as food for the several bacterial types, which are temporarily favoured by a wealth of food for energy and growth. They are, in turn, rapidly reduced in numbers when this stage of the decomposition is completed. And so through the successive stages, until finally the plant foods added in the molasses are again made available for plant nutrition, while the soil gains a residue of the difficultly decomposable substances which are produced, or remain following the decomposition, to become associated with the soil humus, and the soil population again pursues the relatively even tenor of its way.

CONCLUSION.

We must, therefore, regard the soil as a *living* system in which the minute forms of life are ever active, and the results of whose interesting reactions are of such vital importance to the farmer. They pursue their labours for twenty-four hours a day, and seven days in a week; yet they demand as their reward only the waste residues of the crop so worthless to the farmer. Surely they must be regarded as his most efficient workers, whose well-being is worthy of closer attention than is usually their lot.

TO NEW SUBSCRIBERS.

New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

Vinca Rosea.

A REPUTED CURE FOR DIABETES.

By C. T. WHITE, Government Botanist.

In the "Queensland Agricultural Journal" for February, 1925, I wrote an article on the reputed value of *Vinca rosea* as a cure for diabetes. The article was reprinted or referred to in many newspapers and magazines, with the result that a big correspondence resulted and the available stock of reprints soon became exhausted.

Since the article was written the plant has gained a great deal of favour, and some rather wonderful accounts of its value as a curative agent have been given to me.

It was Mrs. H. N. Uffindell, of Lower Mitcham, South Australia, who first drew my attention to the use, in South Africa, of the herb Vinca as a cure for diabetes. Mrs. Uffindell, hearing that the plant was a common weed in Queensland, wrote requesting a supply of leaves, and at the same time enclosed a cutting from a South African paper giving the following directions for the use of the plant.

Vinca Treatment of Diabetes.

Each day boil twenty-seven leaves in three and a-half cups of water for fifteen minutes, then strain. Take one cup after each meal; one hour afterwards as much bicarbonate of soda as can be got on a sixpence in half a glass of warm water. Diet consists of all green vegetables, meat three times a day, game, fowl, or bacon for a change, some apples. Avoid ordinary bread.

In South Africa, Mr. E. E. Whyte, the discoverer of the value of Vinca in diabetes, has put up a proprietary medicine termed "Covinca," for which it is claimed that eight out of every ten cases of sugar diabetes will find the use of Insulin and strict dieting unnecessary.

As the plant is a very common weed in Queensland, the following description and accompanying illustration are published for the use of sufferers who may care to make a trial as to the efficacy or otherwise of the plant. It most commonly occurs along sandy beaches, particularly from Maryborough northwards; about Brisbane and more southern localities it is not so common, but may often be seen as a stray from garden culture.

Two varieties or forms occur, the one with pink (the type) and the other with white flowers (var. *alba*); the properties are most probably the same in both.

Description.—A perennial herbaceous plant 1 to 2 ft. high. Leaves arranged in opposite pairs, elliptic in outline, 1½ to 2½ in. long, nearly 1 in. broad tapering at the base to a short stalk of about ¼ in. Flowers borne in the uppermost leaf axils; calyx green about ¼ in. long divided to about the middle into five narrow lobes; corolla with a slender tube a little over an inch long dividing at the apex into five flat pink or white

PLATE 146.

VINCA ROSEA, A REPUTED CURE FOR DIABETES.

lobes 1½ in. across; lobes obovate rather lop-sided, much narrower towards the base. Seed capsules in pairs, long and narrow, about 1¼ in. long, full of small back oblong seeds, each seed about one line long.

Distribution.—A native of the West Indies and Tropical America, now naturalised in most of the warmer parts of the world.

Common Name.—Species of the genus Vinca are commonly known as Periwinkle.

Botanical Name.—*Vinca,* from the Latin *vinculum,* a bond or fetter, in allusion to the twining shoots of some species of the genus; *rosea,* Latin, referring to the pink colour of the flowers of the type.

Botanical Reference.—*Vinca rosea* Linnæus, species Plantarum 305.

QUEENSLAND SHOW DATES, 1934.

June.

Gayndah, 13th and 14th
Gladstone, 13th and 14th
Wowan, 14th and 15th
Rockhampton, 19th to 23rd
Mackay, 26th to 28th
Laidley, 27th and 28th
Proserpine, 29th and 30th
Townsville Rodeo, 30th

July.

Bowen, 4th and 5th
Gatton, 4th and 5th
Kilcoy, 5th and 6th
Ayr, 6th and 7th
Townsville, 10th to 12th
Woodford, 12th and 13th (Sports only)
Rosewood, 13th and 14th
Cleveland, 13th and 14th
Cairns, 17th to 19th
Charters Towers, 18th and 19th
Caboolture, 20th
Barcaldine, 24th and 25th
Nambour, 18th and 19th
Atherton, 24th and 25th
Esk, 27th and 28th
Pine Rivers, 27th and 28th

August.

Royal National, 6th to 11th
Home Hill, 31st August and 1st September

September.

Enoggera, 1st
Imbil, 7th and 8th
Ingham, 7th and 8th
Pomona, 12th and 13th
Innisfail, 14th and 15th
Mareeba, 20th and 21st
Beenleigh, 20th and 21st
Rocklea, 22nd
Malanda, 26th and 27th
Kenilworth, 29th

October.

Southport, 5th
Millaa Millaa, 5th and 6th
Tully, 12th and 13th

Wheat Varieties in Queensland.

H. W. BALL, Assistant Experimentalist.

IT is considered that wheat farmers will be interested in the relative popularity of wheat varieties grown in Queensland. A census supplied by the State Wheat Board discloses that in 1933 Florence was the most widely grown variety.

Florence has been popular for many years, owing to its ability to yield well over a wide range of soils and climatic conditions. If seasonably sown, it will usually escape rust. Its chief defect is a tendency for the grain to shell in the field when ripe.

To illustrate the changing preference of farmers in recent years the following figures are noted:—

Variety.	Percentage of Total Area Sown from 1929 to 1933.					Area of each Variety in 1933.
	1929.	1930.	1931.	1932.	1933.	Acres.
Florence	11·0	8·64	12·35	14·37	14·95	46,401
*Flora	..	..	1·91	7·18	12·32	38,240
Clarendon	8·9	9·08	16·54	14·07	10·57	32·812
*Three Seas	..	2·4	5·87	6·29	10·51	32,631
Pusa	23·4	28·9	14·47	12·50	9·99	31,023
Gluyas	7·3	6·02	..	6·31	7·93	24,616
*Cedric	7·0	4·85	4·38	6·44	6·83	21,223
Nabawa	..	1·45	..	6·17	4·77	14,715
*Novo	..	3·12	2·09	2·56	3·48	10,800
Cleveland	5·5	..	3·91	3·95	4·37	13,551
Warren	5·6	4·54	3·41	2·57	2·59	8,049
Currawa	8·6	13·74	10·29	2·64	2·27	7,058
*Amby	..	1·68	..	..	1·22	3,780
*Duke of York	..	4·78	..	1·52	1·03	3,198
*Warchief	..	1·17	..	1·05	1·22	3,789
Canberra	..	..	..	..	..	..
Waratah	..	2·67	..	..	..	..
Varieties having smaller percentage than those noted	22·7	6·96	24·78	12·38	5·95	..

* Denotes Queensland bred wheat.

Of particular interest is the fact that the area of wheat sown to varieties bred by Mr. R. E. Soutter, at the Roma State Farm, has now risen to 37 per cent. of the total.

Flora, with 38,240 acres, has moved up to second place. It is a short-strawed wheat of excellent grain quality, which does not shell so readily as Florence when ripe.

Three Seas, a bearded rust-resisting type, is represented with 32,621 acres.

Seafoam, recently released for cultivation, is a similar type to Three Seas but has better quality grain.

The area sown to Seafoam is likely to increase in the near future.

Pusa has lost acreage evidently owing to its susceptibility to damage by frost.

Currawa has also lost ground, and owing to its slow-maturing habit, is now chiefly grown by those desiring to feed off the early growth to sheep.

Nabawa, which is now the leading variety in New South Wales and West Australia, was represented in Queensland with 14,715 acres.

The high proportion of such good quality wheats as Flora, Florence, Pusa, Cedric, and Novo now grown in Queensland is particularly fortunate.

Farmers grow these wheats, not because of the quality but because they yield well under Queensland conditions.

Looking to the future, if production can be continued at a profit, this State should have an export surplus of wheat within the next decade, when our wheats should be more eagerly sought after than the softer wheats grown elsewhere.

GETTING READY FOR MAIZE—IMPORTANCE OF EARLY PLOUGHING.

Deep early ploughing and winter fallow are the most important cultural factors in the growing of maize. Under most conditions this first ploughing should take place in the autumn or early winter. It is almost an invariable rule that, other things being equal, the land that has received the longest preparation gives the best returns. The following results have been obtained from experiments at Grafton Experiment Farm (N.S.W.) averaged over four years:—

	Yield per acre.		
April ploughed	70 bus.	..	21 lb.
June ploughed	62 „	..	37 „
August ploughed	55 „	..	2 „

Land ploughed at the period recommended and left in the rough state during the winter is greatly benefited by the mellowing action of frosts, and is open to receive the winter rains, both of which penetrate more deeply into the soil and subsoil. This, with the greater aeration of the soil, materially improves the soil's chemical and physical character, especially if the ploughing be deep and thorough.

Where undulating land is left unploughed during the winter, much of the rainfall is lost by running off the hard surface. Most of this could be conserved if the land were deeply ploughed and left rough. On hillsides and where the winter rains are excessive it may be found advisable to plough the land in autumn and plant a cover crop like peas, clover or rape to cover the ground during the winter and prevent erosion of the soil. In all cases where hillside land is cultivated it is preferable to plough and plant across the slope of the hills in order to save the soil from washing.

On flat lands that drain poorly recourse may often be had to ploughing the ground in narrow strips about 8 feet or 12 feet wide, on which two or three rows of maize are planted, with a "dead" furrow or open drain between each strip to carry off the surplus moisture.

Malting Barley.

TOWARDS the end of 1932, to satisfy a general desire expressed by barley-growers for a change of seed of malting varieties, the Department of Agriculture obtained small quantities from England of the following varieties of malting barley:—Winter Archer, Spratt Archer, and Plumage Archer.

Similarly, the Queensland Barley Board interested itself in obtaining supplies of seed of Plumage Archer from Tasmania.

The three barleys imported by the Department were subjected to analysis on arrival and were placed with two well-known barley-growers at Nobby for propagation purposes. Similarly, the varieties from New Zealand were submitted for analysis and germination test.

Owing to the fact that climatic conditions obtaining during the period of harvesting, or immediately prior thereto, were adverse for the production of a first-class malting barley, the protein and carbohydrate content of this season's barley have been affected. Coincidentally, climatic factors have more or less affected the germination of these barleys. The following tabulated information will give some indication of the change that has taken place:—

——	Moisture.	Protein.	Fat.	Carbohydrate.	Fibre.	Ash.	Germination.
1932.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
*Spratt Archer ..	12·0	8·6	1·3	71·7	4·1	2·3	98
†Plumage Archer..	14·8	8·1	1·1	68·9	4·8	2·3	80
†Spratt Archer ..	13·7	7·7	1·3	70·8	4·3	2·2	82
†Winter Archer ..	14·2	7·5	1·3	70·3	4·3	2·4	79
1933.							
*Spratt Archer ..	11·1	9·8	1·3	70·2	4·9	2·7	98
*Plumage Archer..	13·6	11·8	1·4	65·7	4·9	2·6	88
†Spratt Archer ..	13·6	12·3	1·2	65·3	5·2	2·4	97
†Plumage Archer..	14·3	15·2	1·2	61·7	5·1	2·5	85
†Winter Archer ..	13·6	12·2	1·0	65·7	4·8	2·7	76

*Ex New Zealand. †Ex England.

It is, however, anticipated that these barleys grown under normal seasonal conditions will show considerable improvement over the results given, and farmers who have grown any of them are recommended to continue their growth for at least another season.

If you like this issue of the Journal, kindly bring it under the notice of a neighbour who is not already a subscriber. To the man on the land it is free. All that he is asked to do is to complete the Order Form on another page and send it to the Under Secretary, Department of Agriculture and Stock, together with a shilling postal note, or its value in postage stamps, to cover postage for twelve months.

The Selection of Seed Maize.

By C. J. McKEON, Instructor in Agriculture.

As harvesting is now in progress, and as it is just prior to or during harvesting that the selection of seed for next season's planting should be made, Mr. McKeon's notes on the selection of seed will be of interest to those growers who have pure strains of a high-yielding variety which has proved suitable for their particular locality and who are desirous of obtaining their requirements for the next season's planting from their own crops.—ED.

ANY grower who practices careful seed selection is well repaid for the small amount of extra labour which this entails, and the high quality of much of the maize that is now being produced in the various districts goes to prove that a large percentage of growers are fully alive to this and also to the wisdom of growing only proved high-yielding pure strains.

Growers who have not a pure strain of a high-yielding variety known to be suited to their particular locality, and who are desirous of having them, should be sure that they are getting their seed from a reliable source, otherwise the resultant crops will probably prove to them that the crop from which the seed was selected was grown in close proximity to a different, and probably mixed, variety, and that cross fertilization had occurred.

Growers in closely settled districts frequently experience trouble in keeping varieties pure owing to cross fertilization with other varieties growing on adjoining farms, as a result of the pollen being borne by wind and insects from one crop to another. This can only occur, however, when crops tassel at the same time and a difference of a few weeks between the plantings is sufficient to prevent it from happening. Where this is not possible, owing to advantage having to be taken of suitable rains, and the two crops happen to tassel at much the same time, care should be taken to confine the selection work to the portion of the crop furthest from the other crop, and, if possible, away from the direction from which the prevailing winds blow. Where possible, the field selection should be carried out prior to harvesting and at a time when the ears are ripe enough for picking, but when it is still possible to distinguish between the early and late maturing plants.

Look for Ears of Even Ripeness.

By continually selecting as nearly as possible only ears of even ripeness, the resultant crop will tassel more evenly than if an indiscriminate selection of early and late maturing ears were made and consequently a much better fertilization will occur, the result being well-filled ears.

Where the tasselling extends over too lengthy a period, fertilization, except under unusually favourable conditions, is not as good owing to the fact that the supply of pollen is more limited and many of the plants may have to depend largely on their own supply of pollen for fertilization.

Seed Ripened Prematurely Should be Rejected.

In selecting from early maturing plants, particular care should be taken to see that ripening occurred naturally and was not the result of disease or injury. During the present season, and this applies particularly to some of the coastal districts, many of the crops were more or less affected with maize blight and consequently any badly affected plants will have ripened prematurely and should be carefully avoided. Affected plants are easily distinguished, even when dry, by the peculiar whitened appearance of the leaf. The ears will also be found to be lacking in that firm feel which is typical of a sound healthy ear and the grain will be also more or less pinched and loosely packed.

Insect Injury.

Another common cause of forced ripening is injury by the maize grub, and where this is the cause, it will be found that the grub has bored through or into the shank or core.

Select Seed from Healthy Plants.

Selections should be made only from strong healthy plants with a good root system and from those which are growing in an average stand and not in an isolated or favoured position. A good root system is very important, for a plant with a poorly developed root system cannot withstand drought; it is more easily blown down by the wind and there is also the possibility of the poor development being due to disease.

An ear from a diseased plant will frequently be found to possess a weak, easily shredded shank, and it will also be found that the core at the butt is discoloured and hollow or partly so.

Ears showing any of these signs should be discarded and only those which possess firm shanks which break away cleanly and show a clean healthy pith at the base should be chosen.

Other Important Points.

The height of the ears on the plant is another very important point to be considered. They should be borne at, or slightly below the middle of the plant, for where they are borne high up on the stalk, harvesting is rendered more difficult and the plants will lodge much more readily during wind storms.

Ears with a shank of medium length and thickness which turn down during ripening should be selected in preference to those with a short, thick shank which remain erect. An ear when turned down will shed water more readily and is also less liable to become damaged by birds and insects than those which remain in an upright position, providing of course the husk covering extends well over the tip of the ear.

A good husk covering is very necessary, for it will almost invariably be found that an ear which has the tip protruding is more or less damaged by water or insect attack.

Regarding the number of ears to the plant, it is advisable to select from the plants which bear one good ear and at the most two, providing one of them is of standard size. Otherwise it will be found that the tendency will be to produce several small ears, with the result that the quality of the grain is affected and the cost of harvesting is increased. The points already discussed will show how necessary it is to carry out

the seed selection in the field, if a grower wishes to improve the variety and at the same time retain the desirable characteristics which the variety possesses.

Where this is not practised and the selection work is left until the crop has been picked it will be impossible to tell under what conditions the ears were produced, and many which are produced under most favourable conditions will be selected in preference to others which are only slightly smaller, but which were produced under average or probably adverse conditions. Naturally, those produced under average or adverse conditions would be of much greater value for seed purposes than those produced under favoured conditions.

It is advisable to always select considerably more ears in the field than will actually be required for seed purposes. The final selection should be made in the barn and the ears selected should be of good size, without being coarse, and should also be of uniform type, shape, and colour. They should be cylindrical in shape, except in the case of a few varieties which produce a slightly tapering ear, and should be well filled up to the tip.

The types of dents vary, a few varieties having a "smooth" or "dimple" dent, but the majority of the most popular varieties now grown in this State have a "crease" to a "medium rough" dent. Grain with a "pinch" dent should be avoided, and, although it is usually of good depth, it is almost invariably light and of a soft starchy nature and will never command the price that plump, well-filled maize will. The shape of the grain varies according to the variety; those which produce ears with less than fourteen rows, such as Golden Beauty and Hawkesbury Champion or Golden King, have a slightly round-shouldered, broad grain of medium depth. Those which produce ears with fourteen rows and upwards should have square-shouldered, tightly packed grain with only a very small space between the rows. The grain should be firmly attached and should show little or no movement when pressed with the points of the fingers. Ears with coarse, sappy piths or cores should not be selected, as they dry out slowly and generally show a lower shelling percentage than those with a medium-sized core.

Uniformity is breadth and shape of grain is a very important point, and is one which should be strictly adhered to if the variety type is to be preserved.

The colour of grain differs according to variety, some of the yellow varieties having a bright amber-coloured grain with a rich yellow cap, and others a pale, amber-coloured grain with a light cream-coloured cap.

Whatever colour is being selected, uniformity should be practised and on no account should an ear of a yellow variety, for instance, be selected which shows reddish or white grains. The straightness and evenness of the rows, while being desirable features, are less important than those already discussed, and as long as they are reasonably straight and even and the ears are otherwise desirable they need not be discarded.

The ears should be topped and tailed before shelling, not that the round grains from the tips and butts would not germinate, but because it is impossible to get an even sowing with a planter with seed that lacks uniformity in shape and size.

Before the seed is stored it should be thoroughly dry and quite free from injurious insects.

The quantity of seed maize required for the average farm is not large, and it is quite a simple matter to store the grain and keep it in good condition for the following season's planting. All that is necessary is an airtight container, such as a carbide drum, and, after making certain that the grain is thoroughly dry, it can be placed in this with a small quantity of flaked naphthalene mixed well through it and the lid sealed down. The naphthalene will destroy any moth or insects which may hatch after the grain is placed in the container, and will not affect the germination.

The Irrigation of Tobacco.

By N. A. R. POLLOCK, H.D.A., Senior Instructor in Agriculture.

THE production of bright tobacco leaf is not favoured in districts where growth is wholly dependent on the moisture supplied by irrigation, owing to the adverse effect on leaf quality of the extremely dry atmosphere there prevailing.

In many of the recommended tobacco-growing districts of the State, however, there are times when the application of water will prove of very great benefit if used judicially, either when planting out or later when a check in growth is anticipated through a delayed fall of rain.

Before discussing the crop under irrigation, it is well to consider the effect of the application of water on the soil and its influence on those factors intimately connected with the growth of plants.

Crop Essentials.

For the best growth it is essential that a sufficiency of plant food, soil moisture, air and light should be provided under a suitable soil temperature. It is also essential that there should be no toxic or injurious substances in the soil such as might be added by the application of water carrying deleterious salts, such as sodium carbonate, or sodium chloride, in solution.

As the water available for irrigation in districts suitable for bright tobacco production is remarkably free from such impurities, its use will cause no trouble in the latter direction which therefore need not now be discussed.

Mechanical Effect of Irrigation.

It remains then to consider the mechanical effect of water when applied in quantity to the soil.

When in good tilth a soil is composed of little clusters of soil particles which create a loose, open or crumb structure, thus allowing a ready and deep penetration of roots into the soil, a good aeration and easy entrance of water.

The effect of water standing for some time on the soil, as in furrow irrigation, or when it collects on the surface from extra heavy falls of rain, is to break down these crumbs into their constituent small particles. These tend especially in the heavier soils to pack together and to make the soil relatively impervious.

It will be realised then that irrigation water may have a very marked effect on an essential factor in plant growth, namely, the air

in the soil. When the soil particles are closely packed and a crust or cake forms on the surface, there can only be a very slow exchange between the air of the soil and the atmosphere above. The result of this is that there is insufficient oxygen for proper root development or for the use of those soil organisms that break down organic matter and make plant food available. Further, it may be noted that certain injurious organisms which reduce oxidised compounds to form injurious reduction products thrive in poorly aerated soils. Thus another factor, that of the supply of plant food, is affected. Without the free circulation of air, especially when the soil is saturated with moisture, its temperature is likely to be unduly lowered.

An additional defect in this packing of the soil, unless remedied, is the slow percolation of water in subsequent applications.

It will be abundantly clear from the foregoing that the maintenance of a friable pervious condition of the soil is of major importance when a crop is grown under irrigation. It is an axiom that irrigation and drainage should go hand in hand as without the latter the avoidance of excess in application is not easy.

The maintenance of just the necessary amount of moisture in the soil without interference with the supply of air and light or undue disturbance of the soil temperature should be the objective when applications are made.

Soil Moisture Requirements.

It is calculated as the result of experiments in many countries that the optimum crop growth is made when the soil has 50 to 60 per cent. of its maximum capacity for water satisfied. This is equivalent in an average soil to 2 inches of water per foot of depth. Consequently amounts over that quantity equally with those under it will tend to lessen growth. The amount of water calculated as in the soil when a crop wilts is about 1 inch. This suggests that to bring the soil to its desired moisture content when wilting occurs, an application of 1 inch to each foot in depth is necessary.

An ideal system of irrigation is one that most closely approaches a light shower of rain, when each drop penetrates as it falls without at any time causing complete saturation or allowing water to accumulate on the surface. The expense, however, of installing such a system would probably be prohibitive.

Methods of Watering.

The general method of application for a tobacco crop will be in furrows between the rows of plants which would be grown on hills or ridges.

In application by this method it is advisable to consider the manner in which the water becomes distributed through the soil. Percolation downward and laterally is to be expected, the rapidity of the former and extent of the latter being determined by the looseness of the soil. As a rule percolation downward to at least the depth of the ploughing is much more rapid than that laterally, but it can be expected on most soils with ordinary applications that lateral percolation will allow the moisture to become equally distributed in the soil between furrows and to rise by capillarity in the hills or ridges.

To allow of similar distribution in subsequent application it is evident the soil between hills or ridges should be well broken after each irrigation.

To avoid excess in any one part it is essential that the field should be graded so that the fall would be even throughout the length of the furrows. Implements to secure this will be found in the Buck-scraper, Louver grader, and smoother and leveller, which may be purchased or made on the farm from plans available from the Subdepartment of Irrigation and Water Supply or through the Department of Agriculture.

The length of irrigating furrows will be decided by their fall. With little slope an excess is likely on the first part of long furrows before sufficient water has reached the end. On the other hand too steep a fall will allow of erosion. In general the less the slope the shorter should be the furrow, and the quicker the application.

Damage from Soil Saturation.

The tobacco crop is perhaps more subject than others to damage from soil saturation since excess of moisture inhibits root extension and invites the attack of particular fungi, the effects of which with following bacteria are commonly described as root rots.

On deep sandy soils or where a good drainage is provided, less damage from excessive applications can be anticipated, but here the supply of water beyond a sufficiency can be regarded at the least as a waste of time and money. On soils possessing a somewhat retentive subsoil, or where the particles are so small as to render under drainage very slow, soil saturation is an ever present danger.

The evil effect of saturation on such soils, as previously mentioned, is due not only to the excess of moisture in itself but to the reduction of soil temperature and its action in preventing the ingress of air and light to the soil, all of which factors contribute so materially to normal plant growth.

When to Cultivate.

Cultivation should, as soon as practicable, follow the application of water to the soil not only to allow of its aeration but to check evaporation. The number of cultivations between applications will be regulated by the soil texture, the aim being to secure a loose but not unduly rough surface. Particularly is this cultivation necessary on fine-textured soils carrying a proportion of silt and clay, where a crust forms after rain.

Hilling the Crop.

In tobacco culture it is the general practice arising from years of experience to grow the plants on hills or ridges, and especially is this considered advisable when the crop is irrigated.

The land being well ploughed and the soil brought to a satisfactory tilth, it is advised to throw up hills in the following manner at the desired intervals. A full furrow is turned and when the fertilizer is distributed at the back of the sod so turned another sod from a furrow ploughed in the reverse direction is thrown against it to form a ridge similar to the formation of a crown when a field is cross ploughed. There will thus be two furrows with the ridge between.

Planting Points.

If the soil is not sufficiently moist to allow of planting, a good irrigation should be given to one of the furrows some little time, preferably the day before, the plants are to be set out. This will allow time

for the water to percolate laterally and rise by capillarity in the hill to permit of the roots of the plants, set in the centre line of the hill, being placed in moist soil while that of the surface remains loose and friable. If there has been insufficient rain prior to planting to supply sufficient moisture over the whole field, an application of water in the second furrow is suggested, immediately after planting is completed. It is not desirable to apply water in both furrows prior to planting as the planter will walk in one when setting the plants out.

As soon as practicable, from two to four days usually, after the application of water a deep cultivation should be given between the hills, special attention being given to break the cake or crust formed and to fill in the furrows which carried the water. A further cultivation should follow a week later when the soil should be rendered loose and friable, both on the ridges and between. Subsequent applications of water given in furrows midway between rows of plants will be governed by the rainfall, if any, the porosity of the soil, and the behaviour of the plants which will show a wilting of the leaves immediately the supply is below requirements. It should be noted that the finer the particles and the greater the content of humus and decaying organic matter in the soil, the more is its capacity for the absorption of moisture increased. Deep, slow-draining soils or light soils with a somewhat retentive subsoil will require lighter applications than deep porous sands.

Naturally as the plants develop more and more leaves, the demand on the soil moisture will be increased, suggesting that applications should be heavier or at less frequent intervals.

Great care should be exercised in applying water to the tobacco crop to avoid soil saturation. Irrigation, alternately, between odd and evenly numbered rows, will tend to obviate this danger, as the excess in one can be expected to percolate to the other. It is considered when proper attention is given to cultivation, four or not more than five irrigations should be sufficient to grow the crop. If rain falls at intervals the number will be lessened. After topping a final heavy irrigation should be given without subsequent cultivation. This should be sufficient to carry the crop to the end of the picking.

Cultivation After Irrigation.

Cultivation of the soil after irrigation is imperative to secure good results. Not only does the breaking and loosening of the soil permit a desirable aeration, but the creation of a loose surface or dust mulch retards evaporation of the moisture brought towards the surface by capillary action. The growth of weeds which rob the soil of much moisture is also checked.

Where insufficient cultivation is given more frequent irrigations are necessary. Such a practice is not economical as the cost of production is increased and the value of the product almost certain to be reduced.

When water is applied it is not advisable to use the cultivator until two or more days thereafter, or until the surface is sufficiently dry to allow the passage of a horse without sinking and the soil to break without adhering to the implement. The first cultivation after the plants are set out should be deep from hill to hill without, however, disturbing the soil of the latter, which should be lightly broken with a

hoe or rake if a crust has formed. Disturbance of the soil in the hill to any depth at this stage is apt to interfere with the strike of plants. A second cultivation should be given a week after the first to further fine the soil and to check any weed growth.

If rain does not fall and no weed growth appears, it is not necessary to cultivate again until after further irrigation.

The second and subsequent irrigations should be in furrows midway between the rows of plants.

After about three weeks the plants will have all struck and made growth so that disturbance of the soil on the outside of the hills with the cultivator will be beneficial in that lateral percolation will be assisted.

In the next cultivation some of the soil should be drawn to the hills to enlarge them.

So, after each application of water the immediate cultivation should be to break up the soil and that following to fine the soil and to build up the hills until, at the final irrigation after topping, the plants are growing on "hogbacks" or round-topped ridges with a furrow between.

The depth of cultivation should be deep, 3 or 4 inches in the centre between rows, becoming shallower to around 2 inches as the plants are approached. After the final irrigation when the plants are topped, further cultivation should not be attempted.

At this stage the leaves will be approaching maturity when the lack of aeration of the soil will assist in the yellowing or ripening of the leaf.

As the plants grow the leaves will project towards the centre of the rows to such an extent that the use of the cultivator might be expected to cause damage.

In early morning the leaves will be brittle but after a few hours of sunshine they will become much more supple. If a short spreader is used on the trace chains just sufficient to keep them from chafing the horse's legs, cultivations can be used from about 10 a.m. to sunset without damage to plants until the flower heads form.

During growth the soil immediately around and between plants should be kept loose and open for 1 to 2 inches in depth by the use of hoe or rake. Priming should receive careful attention, leaves showing leaf-miner being carried off and burnt immediately. Destruction of the insect in the larval stage by this means will lower or prevent future infestation.

The objective in setting out the plants on hills in the first place is to promote drainage and to prevent the saturation of the soil, particularly at the base of the plant. The further building up of the hills not only assists in that direction but adds more plant food to the feeding roots which run close to the surface and encourages the deeper lateral roots to spread further and so more readily secure the moisture demanded.

A properly cultivated plant, whether grown by irrigation or otherwise, will not only exhibit a better root structure and be more stable, but will produce leaf of better quality.

Fat Lamb Raising.

By JAS. CAREW, Senior Instructor in Sheep and Wool.*

FAT lamb raising, as combined with agriculture, is an enterprise in which every farmer who has sufficient suitable land available should engage. The holding should contain sufficient good agricultural land to produce the fattening crops necessary for that purpose, and also to provide some reserves during good years in the form of hay ensilage and grain. To back this up there should be a sufficient area of good grazing country to run the flock on at all times, other than when mothering the lambs. Some localities possess distinct advantages for lamb raising, such as a combination of the desired type of country in a suitable rainfall region, congenial climatic conditions, and convenience of situation in respect of railway facilities, markets or abattoirs. Many parts of the Darling Downs, West Moreton, and the Burnett are, therefore, very suitable for an extension of the industry.

Having the land, the next thing is to so improve it that it can be worked conveniently to the best advantage. Fences should be so arranged as to allow for changing or spelling paddocks, with suitable provision for watering. I do not advocate the changing over from an established industry to fat lamb raising, but I do think that there is room for a vast extension without unduly interfering with progress in other branches of primary production. Every farm should be as self-contained as possible, and without sheep many farmers are not getting the best out of their property. The chief reasons why more farmers are not keeping sheep are, firstly, that sufficient provision is not made for running them properly; secondly, that the breed or type first introduced is not suitable to the country or conditions; thirdly, that the health of the sheep is not sufficiently safeguarded, or that the country is not suitable to maintain health; and fourthly, by depredations by dogs.

The Foundation of the Farmer's Flock.

For fat lamb production a suitable breeding flock is necessary, and herein many different opinions prevail. For best results in production, a good type of ewe of the English long wool—half-bred Merino cross takes pride of place, and should be selected according to the cross most suitable for the district. For the heavier rainfall regions, I consider that the nearer they are to the Romney Marsh the better, while on the more elevated areas and in the lesser rainfall belt such as the Darling Downs, I give preference to the Border Leicester cross in the breeding flock.

The Border Leicesters carry a large carcass, are clean on the head and points, quick to mature, good milk producers, handy to handle, and produce a fair weight of good quality crossbred wool, for which there is usually a ready sale. They cross successfully with the different Downs breeds, the progeny being good growers and fatten at an early age, their chief disadvantage being that they do not mate successfully

* In a radio broadcast from Station 4QG.

during the spring or early summer. Like the other English long-wool breeds they mate best in the autumn.

It is difficult in Queensland to secure a good line of crossbred ewes to form a breeding flock, therefore they will need to be bred up. This can be accomplished by securing the desired number of western bred Merino ewes of the plain, large-framed type. These will be all the better if they are 6-tooths, which have previously reared a lamb. By mating these ewes with the Romney Marsh or Border Leicester rams, according to the location, the ewe progeny can be retained for breeding purposes. After sufficient lambs are reared to form the breeding flock, and while the ewes are still capable of being fattened they should be disposed of as fats and not allowed to become broken mouthed and decrepit. A sufficient number of Merino ewes should be kept or introduced to make up wastage. After the crossbreds have produced about five lambs they, in turn, should be fattened off, at which time they should command a good price as they possess a good carcass for the butcher.

The Lincoln and their crosses are generally more robust than the Border Leicesters, and will last longer as breeders, but neither they nor the English Leicester possess any particular advantage over the Romney Marsh or Border Leicester to favour their claims in producing a farmer's flock.

Purebred Merino ewes have special claims as a farmer's breeding flock, owing to their adaptability of mating successfully both in autumn and spring, or early summer. It is usually an easy matter to purchase a flock of suitable age and type, which will produce a valuable fleece. Their chief disadvantages are that they are rather scanty milk producers, they do not lend themselves to close farming conditions, and are careless as mothers. The English long wool Merino cross, on the other hand, can be worked conveniently; they are large in frame, strong in constitution, and are good milk producers. All these qualities are important in securing a quick development in the young lambs and assist in getting them off at the earliest possible age.

Although the ewe flock is very important, they do not exert the same influence over the progeny as the sires. It is owing to this influence that we must pay particular attention to both the breed and characteristics of the rams that are introduced.

Market Requirements.

The demand for lambs overseas now is for the young, succulent, plump and of not more than 33 lb. dressed weight, carcass showing plenty of bloom. To secure this type the Downs breeds are likely to produce most of these characteristics, the Southdown and Dorset Horns probably appearing to best advantage. This does not infer that other types of dressed carcasses fall away to any extent in price per lb., such as a prime 38-lb. Border Leicester, which can be secured at or before five months. Whatever breed of ram is used, they should be pure, true to type, and kept healthy.

Even when breeding on proper lines, the only way to secure and place prime lambs on the market is to give them a good start and then

keep them going without a check to the time of trucking. The natural grasses are seldom good enough for the length of time needed to top them off, therefore success in a general way can only be looked for in co-operation with crop production. This indicates that those engaging in fat lamb raising must, be to some extent, agriculturists as well as having a knowledge of sheep husbandry.

Flock Management.

Crops must be timed to come in to suit the fattening period. Those for winter and spring feeding may include oats, wheat, barley, rape, and turnips; while the panicums, millet, and Sudan grass, may be selected for summer and autumn feeding. If lucerne can be grown successfully, it should form the chief supply, as it is one of the best and most economic fodders, but it must have other pastures associated with it as a change.

If the ewes are moved on to good feed soon after lambing, their milk supply will increase, and if marked at from two to three weeks they will not suffer much of a setback, and if sold right off the mother they should carry plenty bloom. At this age they cannot be expected to stand up to hardship and starvation, therefore quick transport, careful handling, and immediate treatment at the works are important factors in avoiding loss and maintaining an attractive carcass appearance. Evenness of type is another point of importance, and for that reason too many breeds or crosses are not desirable.

Lamb Raising Scheme.

Recently the Department of Agriculture and Stock introduced a Fat Lamb Raising Scheme under which about eighty rams of the Border Leicester, Southdown, and Dorset Horn breeds were distributed among over thirty growers, with the intention of encouraging fat lamb production; and, at the same time, securing data likely to be helpful in determining the most suitable breeds and types to produce.

The conditions under which these rams are made available to farmers are that they have free use of them during the time the scheme is in operation, but that the rams remain the property of the Department. The farmer undertakes to care for and have them shorn, and to co-operate with the Department in recording all necessary details. The whole of the progeny is the property of the producer, but a percentage of them are to be consigned to the Brisbane Abattoir, to be treated there and reported on for the purpose of the scheme. Further, the Queensland Meat Industry Board has undertaken to obtain a report from England in regard to their condition and quality on arrival there.

Besides the ordinary method of selling through the yards and the buyer having the lambs treated at the abattoirs for export, they may also be treated on the owner's account for export. In this connection, the following particulars should be observed:—

1. Before sending lamb to the abattoir, producers must book killing space, stating number to be treated and suggesting the most suitable date. The Meat Board will then allot space and notify the producer upon which day the lambs should arrive at Cannon Hill.

2. Producers booking killing space will be expected to utilise it, or, if not required, to notify the Board as long as possible before the date booked for killing.

3. Lamb must be consigned to the Board and full particulars of the consignment furnished the Board.

4. The Board will take delivery of the stock at Cannon Hill.

5. The Board will slaughter, weigh, grade, freeze, and wrap carcasses and, subject to space being available, will provide up to 28 days' free storage at a consolidated rate of ¾d. per lb.

6. For the convenience of producers, the Board will credit the producers with the value of fat, kidneys, tongues, livers and rejects, at market rates and, if desired, will dispose of the skins on the producers' account to the best advantage.

7. The consolidated rate of ¾d. per lb. includes loading aboard steamer at the abattoir wharf. The Board will arrange the shipment and will prepare documents, which the Board will hand to the producers' bankers, or other agents through whose agency they wish the meat disposed of.

8. With regard to the minimum of lamb the Board will treat on owner's account for any one client, it would be advisable from the standpoint of economy to fix a minimum of 250 head, and this would not preclude owners of smaller lots in any neighbourhood pooling their lamb to make the required amount.

9. Lamb will be graded as to quality and weight in accordance with export standards and, unless otherwise arranged, will be branded with the Board's registered brand, and each parcel shipped will be specially marked according to ownership.

10. Insurance of meat while in store awaiting shipment, while in transit, and for a certain period at destination will be for owner's expenses.

Insurance to the United Kingdom and Continent—Rate 30s. 6d. plus 25½ per cent. exchange, equal net 38s. 4d. per cent. This covers from the time the carcasses are passed into the cooling and/or freezing chambers of the abattoir at Brisbane, and continues on board the vessel and in cold stores in the United Kingdom for a period not exceeding sixty days from arrival at destination.

11. Shipping charges.—Freight on mutton 1d. per lb. plus 18 per cent. exchange—1.0915d. per lb.; freight on lamb 1¼d. per lb. less 10 per cent. plus 18 per cent. exchange—1.3275d. per lb.; harbour dues 2s. per ton; bill of lading 2s. 8d.

London Charges.—Port rate, landing warehousing, cartage, pitching and tolls, and including selling commission at 2 per cent. approximate, 0.362d. per lb.

Stock Licks for Sheep.

J. L. HODGE, Instructor in Sheep and Wool.*

FIRST let it be admitted that in certain cases the need for a sheep lick exists, and that its use is economical if scientifically applied. The need for it should first of all be detected in an otherwise unaccountable falling-off in the condition of the flocks, with a generally unthrifty appearance; apart altogether, of course, from drought and parasites.

The ingredients to be used should be determined scientifically by proved deficiencies in the soils, pastures, and waters to which sheep have access.

This may be determined by an analysis of all three. The prescription should then contain ingredients to make good the deficiencies. The greatest proved deficiency in most Australian pastures is in a lack of phosphates. For this reason, the basis of most sheep licks should contain a material to make this good. The days when salt only was recommended as a lick in season and out of season are long since passed, and science has come to the help of the grazier and indicated what ingredients should be used under a certain set of circumstances.

One frequently hears of the excellence of a lick in a certain district, and under certain conditions, but it does not follow that because it has proved beneficial to one flock in the district mentioned that the lick is going to do the same good work somewhere else, and under an entirely different set of conditions. The ingredients used may have been perfectly right in the first instance, and more or less useless in the other case.

Observe the Condition of the Flock.

The main thing to note is the condition of the flock. Carefully observe any falling-off in condition, not attributable to seasonal circumstances or the attacks of internal parasites, and quickly ascertain the cause. In nearly all cases, it will be found that there is some mineral deficiency, either in the grasses or waters to which sheep have access. The ingredients in the lick, scientifically prescribed, should supply this deficiency.

When sheep are drinking from an artificial water supply, such as bores or wells, analysis is an easy matter, but when the same flock has access to other waters as well, such as rivers, lagoons, and surface tanks, the analysis becomes more complicated. It is necessary, however, to ascertain the quantity of salt in the waters on account of the fact that the greater salt content shown the less of that ingredient would be prescribed in the lick. In the case of waters from wells or bores, it is quite possible that no salt at all would be used.

Lick Recommended.

On the other hand, analysis may prove the entire absence of salt. In this case the addition of the required quantity of salt may form, in weight, the greatest bulk in the lick. Under drought conditions, it is often beneficial to add a protein such as linseed meal, cotton-seed meal, or maize meal to the lick. Under the heading of drought conditions

* In a broadcast from Radio Station 4QG.

comes hungry winter feeding when the pastures are dry and hard. A lick we recommend for such conditions is as follows:—

	Parts.
Nauru phosphate finely ground, or sterilized bonemeal	40
Salt (butcher's quality)	40
Sulphate of iron	4
Epsom salts	4
Linseed, cotton, or maize meal	12

Sterilized bonemeal is to be perferred to Nauru phosphate on account of the fact that it contains not only phosphoric acid which is common to both, but also a protein. However, it is more expensive and the supply is not sufficient to meet the demand.

We would advise graziers to have on hand a supply of the ingredients mentioned, with the object of mixing the lick on the property. Once the object for which the ingredients are prescribed is understood, it should be an easy matter for the sheep man to vary the quantities as conditions for change make their appearance.

The Nauru phosphate or sterilized bonemeal is a necessity, and should always form the basis of the lick, but the salt may be greatly reduced or entirely omitted if the water to which sheep have access is salty. The sulphate of iron is a tonic, and the proportion mentioned may not always be necessary, and the epsom salts, being a laxative, may be either increased for hard scrub or winter feeding or decreased as circumstances dictate.

Taken on broad lines, and under adverse conditions when a lick may be relied upon to do most good to the flocks, the ingredients should consist of phosphates, a protein, a laxative, and a tonic, with the addition of salt, the quantity of which should be governed by the special conditions obtaining at the time.

A Lick Feeder.

The practice of feeding a lick to sheep in open troughs is not to be encouraged; it is wasteful. Besides the risk of loss by rain, the flocks foul the mixture, making it eventually unfit for consumption.

The lick feeder recommended by the Department consists of a V-shaped trough, with a hinged and covered top. There is an aperture at the bottom of the trough which automatically releases the lick. A lick board sufficiently broad for the purposes, is attached to the stand about an inch and a-half below the opening, and at a serviceable height from the ground. A beaded edge is supplied to save unnecessary waste.

Legislation these days makes it compulsory for proprietary vendors to register their licks with the Department of Agriculture and Stock, and to attach a label to each package setting out the contents. Many proprietary licks are on offer. Some are good, some not so good, and some indifferent. The flock master proposing to purchase would be well advised to get the opinion of this Department as to the suitability for his country and particular circumstances. During a good season, the necessity for a lick decreases. This is accounted for by the fact that the pastures themselves are supplying the sheep grazed on them with the necessary minerals and food materials. Proteins are especially plentiful with the early bite or young grass growth. Hence the presence of the materials usually supplied in the lick when the season is adverse.

Beware of Salt Poisoning.

Beware of over-feeding salt to ewes in lamb. There appears to be no doubt that a too-plentiful supply of salt has a good deal to do with what is called lambing sickness, or twin disease, for want of a better name. After half the period of gestation has passed, ewes are particularly susceptible to salt poisoning. It is, therefore, recommended that a great proportion of the salt in a lick should be taken out in the case of the ewes as mentioned.

The lick, as prescribed and containing the salt, may be fed to the dry portion of the flock with safety and advantage.

It should be the object of the flock owner to have his sheep consume from 2 oz. to 3 oz. of a prescribed suitable lick per head per week.

Ewes rearing lambs require more than dry sheep. Weaners and young sheep, too, could with advantage do with more lick than is consumed by the dry portion of the flock.

It is not sufficient that sheep should be placed on grass irrespective of what that grass contains in the matter of proteins and phosphates. It may be a case of malnutrition or practical starvation in the midst of apparent plenty. It is what those grasses contain in the way of tissue, bone, and body-builders which is so important.

Deficiency in minerals and proteins is particularly noticeable on natural grasses during the winter months, even if apparently there is plenty of feed.

It is not economical or necessary that a lick should be supplied all the year round irrespective of seasonal conditions. After good pastoral rains, and when the young pasture is at its highest feeding value, the sheep are naturally supplied with the ingredients which should be in a lick to combat adverse seasonal conditions.

Rule-of-Thumb Methods no Longer Apply.

The days are fast passing when rule-of-thumb methods apply to the care and husbandry of sheep. Imagine what the addition of even half-a-pound of wool per head, brought about by the knowledge of what to do and the care in doing it would mean to both the individual grazier and the State in actual money value!

Graziers sometimes do not detect early enough a loss of condition and bloom in flocks brought about by conditions other than parasites or drought. There is a cause for this loss in condition, and it should be the care of every flock master to ascertain that cause without delay. It will be found in most cases that there is some deficiency in the feed, brought about by the absence of those minerals so necessary to the general health of the sheep.

This deficiency should be detected, and the ingredients required made available in the lick.

It is urged, therefore, that graziers should make themselves fully conversant with the properties of the ingredients recommended in a lick so that they may vary the quantities in accordance with seasonal conditions, to the wellbeing of their flocks and the benefit of their own pockets.

Pig Feeding.

By L. A. DOWNEY, H.D.A., Instructor in Pig Raising.

PART II.

THE most important point to watch in pig feeding is the condition of the stock, for the pork and bacon trades require pigs in a finished, fleshy condition, but not too thin or too fat. The illustrations herein will indicate approximately the right and the wrong condition for porkers or baconers.

It has already been mentioned that pigs require variety in their rations, that at least a portion of their food should be concentrates, that they require both nitrogenous and carbonaceous foods, and that many other factors must be considered in the selection of pig foods.

In the following pages the more common pig foods have been grouped as follows:—(1) Grains and Mill Offals; (2) Protein-rich Concentrates; (3) Dairy By-products; (4) Pasture and Forage Crops; (5) Root Crops; and (6) Miscellaneous Foods. The notes are intended to assist pig raisers in determining the value of each food when used in combination with other foods.

NOTES ON FOODS COMMONLY USED BY QUEENSLAND PIG RAISERS.

(1) Grains and Mill Offals.

Maize.—Maize has a large proportion of digestible nutriments. This is accounted for by its relative lack of moisture and indigestible fibre. The high percentage of carbohydrates brings maize under the class of carbonaceous or fat and heat-forming foods, and as its nutritive ratio is too wide for pigs, maize must be fed in combination with nitrogenous foods. Also, as maize is lacking fibre the addition of some roughage improves the ration.

Maize is also low in mineral content and this lack of sufficient protein and minerals makes it a very unsatisfactory food for pigs unless it is balanced with other foods rich in proteins and minerals. The improper use of maize in unbalanced rations has earned for it a reputation for producing a soft and fat carcass, but it has been amply demonstrated that, when used in complete and balanced rations, maize is one of our best pork-producing foods and its use can be continued with confidence provided its shortcomings are understood.

The quantity of maize used in pig feeding is usually governed by its market value and the price of pork. Approximately 5 to 6 lb. of maize (or its equivalent, as it is not wise to feed maize alone), will produce one pound of dressed pork in good young pigs, or, each bushel of maize should return ten pounds of pork. This knowledge enables the pig raiser to calculate the value of maize as grain and as pork. When maize is worth 2s. 6d. per bushel as grain and dressed pork is worth 5d. per lb. each bushel of maize should be worth 5d. $\times$ 10 = 4s. 2d. as pork. In such a case it would pay the pig raiser to feed all the available maize to good pigs with just sufficient protein-rich foods to balance

the ration. When the value of a bushel of maize is more than the value of 10 lb. of dressed pork, maize should be used as sparingly as possible, and some cheaper carbonaceous food used in its place where practicable.

Maize is one of the most palatable foods for pigs and may be fed on the cob, shelled, crushed or ground, and at times it is harvested by the pigs and eaten off the stalk.

Although American experiments have demonstrated that the increased feeding value of ground maize does not compensate for the expense of grinding, observation here shows that when pigs do not thoroughly chew the whole grain, there is a considerable waste in the excreta, but usually when pigs have been accustomed to feeding on whole maize, either on the cob or shelled, there is practically no waste. If the palatability can be increased by grinding or soaking, then there may be some justification for preparing the grain in this manner.

PLATE 147.

These pigs are not in a finished condition, and require more feeding to prepare them for slaughter either as porkers or baconers.

Wheat.—Wheat is much better supplied with protein than is maize, and the nutritive ratio is much narrower though it is still a little too wide for young pigs. In feeding value, wheat closely resembles maize and it is nearly is palatable as maize. The quality of meat produced from wheat is very satisfactory. Wheat is less frequently used for stock feeding on account of its high average value for human food. Being a small, hard grain, wheat gives much better results if ground before feeding to pigs. Shrivelled wheat usually has a higher protein content than plump grain.

When costly protein-rich foods have to be purchased to balance the grain in the ration, the high protein content is a point in favour of wheat as against maize.

Barley.—Barley is another of the useful grains for the pig's diet: although slightly below the feeding value of maize and wheat, it is palatable and has a reputation for producing an excellent quality meat. Barley requires grinding before feeding to pigs. The nutritive ratio of barley is nearly the same as maize, but its total digestible nutrients are less than those of maize. Its use can be recommended with confidence provided its market value is in accordance with the price of pork.

Sorghum.—Grain sorghums are a much neglected pig food, ranking only a little behind maize in feeding value but seldom used. The hardiness of this crop and its ability to produce grain when maize would fail, deserves the consideration of the pig farmer who would provide a succession of crops for a regular supply of pig feed throughout the year.

Like the other small grains, sorghum grain should be ground before feeding to pigs to get the greatest feeding value, but as the grain can be fed on the heads or even from the standing crop, preparation by grinding will probably not be favoured by most farmers.

Pollard.—Pollard, which is a by-product from the milling of wheat, has its place on the pig farm being very palatable, and usually available at a price to make it worth feeding to pigs.

Pollard contains a much larger percentage of protein than maize, but still it can hardly be classed as a nitrogenous concentrate. Its use in the ration to replace a portion of the grain is often economical, but it must be remembered that pollard is always a purchased food, whereas the grains can be produced on the farm.

A little pollard is very useful in the ration of young pigs immediately before and after weaning. Pollard, although fairly rich in protein is not sufficient to balance up rations of carbonaceous foods as are separated milk or meat meal. Experimental feeding has shown that excessive feeding on pollard produces a soft carcass in pigs, but when pollard is merely used as a supplement to grain, there is little risk of this trouble occurring.

Bran.—Another mill offal, is not such a good food for young pigs as pollard, its fibre content being higher, and its fat and carbohydrates being lower than those of pollard. Bran, however, is a laxative and for this reason it has its use for brood sows about farrowing time, and a bran mash is often given to pigs which are in ill-health, and need some food which will stimulate the bowels.

(2) Protein Rich Concentrates.

Meat Meal.—Meat Meal, which is sold under various trade names, is a by-product from meatworks and abattoirs that should become one of the most valuable foods to the Australian pig farmer. It is a nitrogenous concentrate containing a very high percentage of digestible protein and can be put to excellent use in balancing some of the common carbonaceous and bulky foods.

The Australian pig raiser relies to a great extent upon separated milk for his supply of nitrogenous food to balance the grains, &c., and on account of our climatic conditions the supply of milk products is very irregular, and in most years there is a period when the supply is too low to maintain a full supply of pigs; it is on occasions such as these

when meat meal can be put to good use as a substitute for milk products, thus keeping up a regular supply of pigs throughout the year.

Being a highly-concentrated food as well as being rich in protein, meat meal is a valuable addition to a ration containing a large proportion of roughage. The composition of meat meal varies somewhat—particularly the protein content. As some brands of meat meal contain a proportion of bone, their mineral content is comparatively high. Meat meal is made from waste meat which is free from disease, and is cooked under steam pressure and then dried and ground to a fine meal. It is therefore free of disease-producing organisms and can be fed to stock with safety.

PLATE 148.

These pigs are long and lean, but they appear to be sufficiently finished to dress well.

Pigs can be satisfactorily grown on grain and meat meal without the use of milk when each pig receives ½ lb. of meat meal daily from weaning to baconer stage and as much grain as it requires, which will be about 4 lb. for each 100 lb. live weight. Feeding the fixed amount of meat meal right through and just increasing the grain, automatically widens the nutritive ratio as required.

When pigs have access to protein-rich pasture such as lucerne, the meat meal allowance may be reduced to ¼ lb. daily.

Meat meal costs approximately £10 per ton (the price varies very little). While this price may seem high, when it is remembered that meat meal is very rich in protein and only a very small amount (about 4 oz. to 8 oz. daily per pig) is required to balance the grain in the ration, it will be realised that its use at the right time is economical.

When dealing with maize it was mentioned that that grain was low in protein and minerals, therefore, the special value of meat meal, which is rich in these two nutrients, lies in its suitability for balancing a ration containing maize.

Meat Meal may be fed either wet or dry; when fed wet care should be taken so that there is no residue in the trough to putrify and become offensive in odour and dangerous to the pig. It is a palatable food and is relished by both young and old pigs.

American experiments have demonstrated that for balancing grains a supplementary mixture of two parts of meat meal, one part of linseed meal, and one part of lucerne chaff or meal by weight, is superior to meat meal alone.

Linseed Oil Meal.—Linseed Oil Meal is a protein-rich concentrate which can be used in a similar manner to meat meal. It contains less protein than meat meal, but nevertheless it is a highly nutritious food and has a laxative action on the animal, and therefore it is a valuable addition to the ration when an animal is inclined to become costive.

When used as the only protein-rich supplement to grain, linseed meal does not give such good results as when it is used in combination with supplements such as separated milk, buttermilk, or meat meal.

On account of its laxative action the addition of linseed meal to the ration of sows at farrowing time is a wise practice. The fairly high percentage of oil in this food makes it suitable for feeding to stock which are being prepared for show, giving them a glossy coat. Oily foods should be fed with care as their excessive use tends to produce a soft, oily carcass.

Cottonseed Meal.—This by-product of the cotton seed is a nitrogenous concentrate with a very narrow nutritive ratio. The use of cottonseed meal for pig feeding has been limited because in some cases it has been found to produce poisoning when fed in a fairly large proportion over a lengthy period, although recent experiments, both here and in other countries, indicate that at least half the protein supplement of a ration may consist of cottonseed meal provided it is fed in conjunction with meat meal and mineral matter.

(3) Dairy By-products.

Separated Milk.—Although strictly speaking a nitrogenous supplement for carbonaceous foods such as grains, separated milk is used in Australia very often as the basis of the ration, or as the whole ration, and to a large extent the supply of prime baconers and porkers is dependent on the supply of separated milk.

Separated milk contains no fibre, but about 90 per cent. of water. It is one of the most palatable and nutritious foods for pigs and is unsurpassed as a nitrogenous supplement, being even a little superior to meat meal as a sole supplement to grain. Pigs of all ages relish separated milk, and being rich in minerals, it is particularly valuable for growing pigs and breeding stock. Being produced on most farms where pigs are raised, separated milk will be the cheapest nitrogenous food for pigs, and when there is ample supply available there is really no need to purchase other nitrogenous concentrates to balance up the grains and other carbonaceous foods.

The high water content and the narrow nutritive ratio of separated milk make it unsuitable as a sole diet, and it is best fed in combination with carbonaceous concentrates such as grain and fibrous foods such as pasture. The amount of separated milk required to balance maize in the pig's ration depends on the age of the pig which determines the nutritive ratio required; for example—the younger the pig the narrower the ratio required as a larger proportion of protein is required for growth in the earlier stages of life than when the animal is approaching

maturity and wants more nutrients for producing energy, heat, and fat. If young pigs receive a minimum of three-quarters of a gallon of separated milk per head daily from weaning to baconer stage, they will be receiving sufficient protein from the milk to balance all the grain they can eat. By feeding a constant amount of milk—three-quarters of a gallon daily—and increasing the grain as the pig grows, the correct balance of proteins and carbohydrates is maintained. When just sufficient separated milk is used to balance the ration, the greatest value is being gained from the milk, and the feeding of greater quantities results in a loss of nitrogen from the protein of the milk (only the non-nitrogenous portion of the protein being used to make fat) but there are occasions when milk is available much more cheaply than carbonaceous foods and then it may be more economical to use larger quantities of separated milk. On most Australian dairy farms the separated milk supply is so irregular that excessive quantities have often to be given to pigs in order to dispose of it, irrespective of its feeding value.

PLATE 149.

It is apparent that these pigs have been carried on until they are slightly too fat to give lean, fleshy carcasses. They should have been marketed at lighter weights or given a more limited ration.

Separated milk may be fed fresh or soured. When it is held in vats to sour and thicken, care should be taken not to allow it to putrefy by holding in filthy containers or by holding for too long a period. The ultimate gain from using soured milk is very little if any, and if the milk is fed fresh after the froth has been removed, quite satisfactory results will be obtained. If large amounts of froth form in the pig trough, the pigs may suffer from a form of digestive disorder (wind) which may end disastrously.

Milk, besides being an excellent food for animals, is an excellent medium for the growth of bacteria, hence care should be taken to have the milk free of disease-producing organisms. Milk and its products which come from a cow suffering from tuberculosis, are a common cause of infection in pigs which receive this milk in a raw state. The milk from one tubercular cow may infect all the milk with which it is mixed, and so pigs drinking any of this milk in an uncooked state would be liable to infection.

Unless milk products come from cows that are certified as tubercle-free by a competent person, it is advisable to pasteurise or scald the milk before feeding it to pigs. This is recommended because it is well known that the tubercle germ is destroyed if held at a temperature of 155 deg. Fahr. for twenty minutes or at 180 deg. Fahr. for five minutes. Therefore, all doubtful milk should be heated to these temeperatures as a safeguard against infection of pigs. Heating milk to these temperatures is a fairly difficult problem on the average farm, but there are heating appliances manufactured for this purpose and some farmers are using same with satisfaction.

Buttermilk.—Buttermilk, which is the residue from the cream during the process of buttermaking, is almost identical in composition and feeding value to separated milk, but the buttermilk supplied by butter factories to pig raisers is usually more or less diluted with wash water from the churns, and, of course, its feeding value is reduced according to the amount of water added.

In Queensland the buttermilk from factories is disposed of in varying ways; in the majority of cases a contract for a period of several years is entered into by a farmer to take delivery of the buttermilk and sometimes wash water, from the factory, and the price is calculated either at so much per 1,000 gallons of buttermilk, or at a certain price per annum. The buttermilk is either conveyed through pipes or carted to the pig farm, which should be situated fairly convenient to the factory. At other places the buttermilk is sold to a number of the factory's suppliers at so much per gallon, and it is carted away by the purchaser. Prices paid for buttermilk vary considerably, but the average price is about 10s. to 12s. per 1,000 gallons of buttermilk. At this price, buttermilk would appear to be a cheap food, but when one considers the cost of carting the milk or maintaining a pipeline of about a mile from the factory to the farm, it will be realised that there is more than the actual purchase price in its total cost.

The troublesome feature about buttermilk taken by contract from a factory is the change of seasonal conditions which causes very rapid fluctuation in the buttermilk supply, and as the pig farmer has to keep sufficient stock on hand to consume all the buttermilk that will come in the summer flush period, it will be realised that he cannot at all times feed just sufficient buttermilk to balance the ration, and as pointed out in the notes on separated milk, when more milk is fed than sufficient to balance the ration, the value of the milk is reduced considerably.

Bearing in mind the relatively low cost of buttermilk, the feeder must make the most use of it, as it is doubtful if he can supply any other food at such a low cost, but at the same time, buttermilk, and particularly when it is diluted with water, does not contain sufficient dry matter and has too narrow a nutritive ratio to produce the best results in the pigs, and, therefore, it is best fed in combination with concentrates and forage crops or lucerne hay; but the amounts of these other foods to be fed with the milk must depend on their cost and on the price of pigs.

Buttermilk, like separated milk, may carry the tubercle bacillus and be a source of danger to pigs unless the cream or the buttermilk has been pasteurised. In butter factories pasteurising is done before the cream is put into the butter churns; provided this is carried out

efficiently, that is, if the cream is held at a sufficiently high temperature for a sufficient length of time, there should be no risk of the buttermilk causing infection in the pigs.

Whey.—Although whey is sometimes classed with separated milk and buttermilk as a stock food, it is really in a class of its own. During the process of cheese manufacture, of which whey is the by-product, a proportion of the protein in the form of casein is removed in the cheese, leaving the whey comparatively low in protein content.

With a nutritive ratio 1:9 whey cannot be called a protein-rich food, but, nevertheless, it has its place in cheese-making districts, and is a very valuable adjunct to rations of gain and forage crops provided some nitrogenous concentrate is used to bring up the protein content of the ration. Meat meal in small quantities is useful for this purpose. Feeding experiments have shown whey to be approximately half the value of separated milk.

As in the case of other milk products, whey should be pasteurised before it is fed to pigs in order to minimise the risk of disease in the stock.

PLATE 150.

These pigs were hand-fed twice daily a mixture of 80 per cent. barley meal, 10 per cent. lucerne chaff, and 10 per cent. meat meal, and given water and green lucerne as well. From 37 to 151 lb. live weight they gained 1.2 lb. daily, and made good bacon after slaughter, thus demonstrating that pigs can be grown satisfactorily without milk when meat meal is used. Each pig consumed an average of about ¼ lb. of meat meal daily.

(4) Pasture and Forage Crops.

Although the pig requires concentrates such as grains or meals for best results, it is naturally a grazing animal and is contented when it has the run of a good pasture paddock where it can graze and partake freely of fresh air, exercise, and sunlight, all of which assist in promoting health and growth.

Pasture is usually a comparatively cheap food, and as its use reduces the amount of other more expensive foods required, the maximum use should be made of succulent, nutritious pastures in pig feeding. While permanent grass pastures are useful, a larger bulk of food per season and more palatable food can be provided by cultivated crops.

A considerable saving of labour is effected when the pigs are allowed to do some of their own harvesting, and in this respect the "hogging down" of maturing maize crops provides pigs with the grain requirements of their ration, with a saving of the labour required in harvesting the crop by hand.

Pigs running on good grazing land have less chance of suffering from deficiency of necessary nutrients than pigs which are confined in bare yards or pens and hand fed. The rotational cultivating, cropping, and grazing of pig paddocks helps to maintain the fertility of the land and provides one of the most practical means of controlling diseases and parasites—particularly kidney worms and round worms, which cause serious losses to the pig industry.

It has been pointed out that the greater part of the protein in a plant is present in the young growing portion, and as a large amount of protein is required by pigs, the pasture crops are best fed off when they are young and rich in protein; also at this stage, the crops are more succulent and contain less fibre, thus making them more valuable as pig food. While cattle make fair use of mature grazing crops, pigs make much better gains when fed on crops which have not reached the stage of maturity.

While there are advantages in providing annual crops for pigs, permanent grass pasture is sometimes necessary about the piggery. A mixture of summer-growing and winter-growing grasses with some lucerne or clover makes the best permanent pasture, but some grasses on their own provide good grazing. Perhaps the most outstanding single pasture grass for pigs in our Queensland pig-raising districts is Kikuyu grass. It is a vigorous grower, and when well established stands heavy stocking. The nature of its growth enables Kikuyu to withstand a lot of rooting and tearing about which pigs give a pasture. It is palatable and nutritious and will thrive in a wide range of climatic conditions.

Pigs sometimes do a lot of rooting and destroy a good deal of pasture, and to check this habit they should be removed to another paddock or the snouts should be cut or a ring inserted in the snout to prevent the pigs from rooting. Once pigs have learnt to root, it is difficult to stop them, but a good deal of success has been achieved where young pigs have the top cut off their snouts when they are about six weeks old.

While a good deal of damage may be done by pigs rooting up a lucerne or a paspalum paddock, in many cases the rooting does good; in fact, pigs have proved themselves good pasture renovators on matted paspalum paddocks which required breaking up.

Lucerne.—When one thinks of forage crops he must first consider lucerne which is one of the best all-round stock foods. Although it is still a fairly common idea that lucerne will only grow on deep, rich alluvial soils, it has been demonstrated that this crop will grow with varying amounts of success on a very large range of soils, both on the lowlands and the highlands, provided sufficient care is taken to establish

it properly; the ground should be in sweet condition, well cultivated, free from weeds, and containing ample moisture before the lucerne is sown. Once the stand is established it should be grazed and cut with intelligent care and cultivated and top-dressed as required.

Pigs are severe at times on a lucerne crop, and care should be taken so that they will not destroy the stand; they should be grazed for short periods only, then the lucerne should be mowed. The young growth of lucerne—before it commences to flower—is much more palatable to pigs than the more mature crop, of which the pigs eat very little stalk.

Lucerne, like all other legumes, is rich in protein and minerals, and, therefore, valuable for young pigs and breeding stock. It is palatable and readily eaten by pigs of all ages. Young, succulent lucerne, has a slight laxative action on the bowels and so helps in maintaining the animal in health. Good quality lucerne hay that is not too stalky makes excellent roughage for pigs; although it must only be fed in limited quantities to young stock, breeding sows can be maintained in good condition in lucerne hay with a small amount of grain. Pigs do not always appreciate lucerne hay for a start, and they may be given a little chaff or lucerne meal, either dry or soaked, and mixed with other foods until they become accustomed to it. The best way to feed lucerne hay is by placing it in a rack where the pigs can take it at will; a trough should be placed under the rack so that any leaf falling from the hay will be collected for the pigs. Farmers who have a supply of maize, lucerne, and separated milk have the material for supplying excellent rations to pigs, and in periods when the milk supply is low a good deal of the protein content can be made up by lucerne hay, which can be stored in a time of plenty.

There have been cases where a yellowish colour in pork—detrimental to the trade—has resulted from prolonged grazing on green lucerne, and, therefore, some caution is necessary in feeding green lucerne. However, it is not definitely known what amount of lucerne is required to cause this undesirable colouring, but we know that pigs are often grazed on lucerne for months and no trouble results. To be on the safe side, the lucerne grazing should be used mainly for breeding stock and weaner pigs, and the other stock might be grazed only for short periods. This yellow colouring, which is due to a vegetable colour, may come from other crops as well as lucerne, and in this respect we can only say to feed all things in moderation.

Cowpeas.—Cowpeas are a leguminous crop like lucerne, but they are annual in growth and therefore not so useful as lucerne which lasts for many years. However, cowpeas often fit in well with the cropping practice of the farm and are a useful crop to grow in pig paddocks. Cowpeas are summer growing and require much the same cultivation as maize. The crop lends itself to feeding off when the foliage is green and the seed pods forming, but not ripe, or when more mature the crop can be made into fair quality hay. The climbing varieties of cowpeas are sometimes sown together with maize when the paddock is to be fed off by pigs. The cowpea vine has a characteristic flavour which pigs do not always appreciate readily. This may be overcome in handfeeding by allowing the plants to wilt in the sun for a time after they are cut and before feeding to the pigs.

Field Peas.—Field peas have a similar use to cowpeas, but they are a winter-growing annual crop and require somewhat the same conditions as the winter-growing cereals. Field peas are a protein-rich crop which can be fed off before the seed pods are ripe, or it can be made into fair quality hay, which, together with the peas, makes an excellent food for breeding stock. Sown with barley, oats, or wheat, and fed off in the young growing stages, field peas provide a nicely balanced pasture.

Field peas and rape fit into the pig paddock cropping system in winter, as cowpeas and soybeans fit in during summer; the cereal crops, of course, can be used, but these protein-rich crops just mentioned should always predominate in the pig paddock cropping.

Soybeans.—Soybeans are a summer-growing legume with a feeding value approximating that of the cowpea or field pea. This crop also makes good green forage or good hay.

Peanuts.—Peanuts may be used as a forage crop for pigs, both the foliage and the nuts being eaten. A common practice is to turn the pigs into a field which has been harvested, allowing them to clean up the nuts which have been missed. Peanuts are highly nutritious, containing more than 40 per cent. of protein and being rich in fat. Peanut meal is available on the market and is a similar food to linseed meal. The peanut meal is the residue after most of the oil has been extracted. A characteristic of peanut fat is that it is liquid (oil) at very low temperatures, and animal fat made up from peanut oil will not harden under ordinary chilling treatment with the result that pork or bacon carcasses from animals that have been fed on large quantities of peanuts are soft and oily and unsuitable for the trade.

Owing to their high protein and oil content, peanuts produce very rapid growth in pigs, and put a bright sheen on the pig's coats, and therefore their use may be advocated for sows and litters up to weaning time, or for exhibition stock, but for porkers and baconers their use is dangerous, and for safety it should be discontinued soon after weaning.

Rape.—Rape is an annual crop which should be sown in March, April, or May, and in normal seasons should be ready for feeding off in two or three months after sowing. The cost of seeding rape is comparatively light and the return from it is usually two or three grazings of succulent and nutritious fodder. When it is desired to crop a pig paddock in the interests of sanitation and worm control, rape will be found a most useful crop.

Rape has not the same feeding value as lucerne, but its nutritive ratio is almost the same and it is classed as a nitrogenous fodder although it is not a legume. It happens occasionally that when young, tender-skinned pigs are grazed on rape which is wet with dew or rain, the rape has an irritating effect on the skin. This point should be watched in feeding rape.

When the rape crop has been practically eaten down with only a few leaves showing on each plant, the stock should be removed until the crop recovers. In this way several grazings can be obtained in a season.

Cereal Crops for Forage.—For supplying green forage quickly in spring and summer, maize is very useful, being a quick grower, and it can be used at almost any stage of growth. If fine stems are required,

the maize may be grown thickly in rows or broadcast. This is a wise practice if it is known that the crop will be wanted as greenstuff for pigs because pigs make much better use of the finer-stemmed young maize than they do of the larger stems.

Oats, wheat, and barley either sown alone or with rape or field peas provide very useful pasturage during winter, and if carefully grazed the feeding period may be successfully extended over several months. These crops should be grazed when they are about 10 inches high for at this stage the plants are more succulent, more palatable and contain more protein and less fibre than they do in the later stages of growth. The grazing should be so arranged that the crop is eaten down quickly and then rested until it is sufficiently re-established for grazing again.

Pigs should be moved from the crop paddock during wet weather if it is practicable, as their tramping and rooting may seriously effect the physical condition of heavy soils.

(5) Root Crops.

Sweet Potatoes.—In many parts of Queensland, sweet potatoes are a great standby for the pig raiser during a dry winter and spring, the crop remaining in the ground or in the barn from the time it is mature until it is required for feeding.

Sweet potatoes are a bulky carbonaceous food which may be used to some extent to replace grain in the ration and to add variety and succulence. About 4 lb. of sweet potatoes are equal to 1 lb. of grain. Where soil and climate suit the crop it is inexpensive to produce and is easily stored. The best means of harvesting in most cases is by turning the pigs into the paddock. It is not only the tubers that are useful as food, but the vines also make good green fodder, although here a warning must be given to the effect that there are on record, cases of prussic acid poisoning following the feeding of sweet potato vines to pigs. These cases, however, are so very few compared with the large number of pigs which are fed on this crop, that the risk of poisoning would appear to be very slight. The feeding of molasses is recommended to counteract any ill-effect from the vines.

When pigs are fed on a fairly large amount of sweet potatoes they should be given liberal supplies of protein-rich foods such as separated milk and meat meal.

Arrowroot (*Canna edulis*).—The arrowroot grown in the coastal districts of Queensland has a place in pig feeding in those districts on account of its heavy yielding and hardy nature and its ability to stand in the field for a long period before being harvested. Arrowroot is not a very nutritious crop, but it supplies a large bulk of succulent food which pigs relish.

Arrowroot is sometimes harvested and then boiled before being fed to pigs, but when one sees pigs harvesting the crop for themselves and doing very well and wasting very little of the crop, one wonders if boiling is really a wise practice. Although most of the nutriment is in the bulbs of arrowroot, the pigs will eat the tops which are usually very succulent. Arrowroot is a carbonaceous roughage and should be fed in combination with more concentrated and protein-rich foods. When feeding off arrowroot—as with all crops—it is advisable to run a

temporary fence across the block to confine the pigs to a small area until they have harvested it satisfactorily. In this way, the waste can be kept at a minimum.

Mangels.—The particular value of the mangel as a root crop for pig feeding lies in its ability to withstand a dry spring, provided it is well established in the autumn. The growing period is somewhat long, but if sown in the autumn, the mangel should be ready for feeding early in the following summer when other succulent fodders are usually scarce, and if it is not required when fully grown, the crop may be left in the ground for a few months without much deterioration resulting.

Mangels are a bulky, watery food containing about 85 per cent. of water, but they are succulent and palatable and at the same time they supply a certain amount of nutriment in the form of protein and carbohydrates. Like the sweet potato and arrowroot, mangels are a heavy yielding crop and worthy of a place in the cropping system of pig feeding.

Artichokes (Jerusalem Artichokes).—Although the sweet potato takes the place of artichokes in most cases on account of its heavier yielding capacity, artichokes are grown to some extent as a pig food. The artichokes might be expected to give about two-thirds of the yield that sweet potatoes would give, but they have a narrower nutritive ratio than sweet potatoes, being richer in protein and lower in carbohydrate content.

Artichokes are grown in a similar manner to sweet potatoes, except that they are propagated by tubers. If planted in the spring, artichokes should be ready to harvest in autumn, but if desired they may be left in well-drained soils right through the winter before harvesting.

The tubers may be dug by hand or ploughed out or the pigs may be turned on to the crop to do their own harvesting. If hand dug, sufficient tubers may be left in the ground to give a crop in the following season, and if the pigs are doing the job they should be removed before all the tubers have been eaten out and the land should then be harrowed and left to produce the next season's crop. Being a carbonaceous roughage, the artichoke should be fed together with nitrogenous foods and concentrates.

Potatoes.—The ordinary English potato is usually too high in price as a human food to be used for pigs, but there are times when unmarketable potatoes are available for pig food. They are a carbonaceous food of fair feeding value and should be boiled before feeding to the pigs. About 4 lb. of potatoes are equal to 1 lb. of grain as pig food.

(6) Miscellaneous Foods.

Pumpkins.—In practically every pig-raising district of Queensland, pumpkins can be grown with comparatively little trouble, and their usual heavy yields, together with their excellent keeping qualities, make this crop one of the most important for the pig raiser. Pumpkins contain over 80 per cent. of water and therefore are bulky, but they are palatable to pigs and are best fed raw. The seeds of pumpkins contain fair amounts of oil and protein, and they also act as a mild vermifuge (i.e., they expel worms from the digestive tract of pigs) so the seeds should not be wasted, but they should be fed with caution as digestive troubles sometimes occur when excessive amounts of seeds are fed without the flesh of the pumpkin.

The market value of pumpkins is sometimes so high as to make them too valuable as human food to be given to pigs, but on the whole, a large portion of the pumpkins grown in Queensland are fed to pigs. They can be ready for feeding in a good season from December onwards and if stored in a dry, cool place and picked over frequently to remove the rotting ones, the pumpkin supply can be kept up till the following summer.

Pigs relish pumkpins and the crop fits in the cropping system very well and they are useful when fed in combination with maize, milk, and lucerne. Cases of yellow colouration in the pork of pigs fed heavily on pumpkins have been reported, and in this respect care should be taken not to overdo pumpkin feeding with porkers and baconers.

Melons.—Melons are sometimes used as pig feed, but contain about 95 per cent. of water and are therefore not so nutritious as pumpkins which contain about 83 per cent. of water.

Molasses.—Molasses has its uses as a pig food, but unfortunately its value is often over-estimated and farmers expect it to do more than it really can with the result that various dietetic troubles occur in the stock. Molasses contains about 57 per cent. of digestible carbohydrates which are in the form of sugar and its digestible protein is nil. It is therefore a fat, heat and energy producing food, but not a flesh former.

Molasses has a laxative effect on stock and for this reason it is valuable, during dry seasons when succulent green fodder is not available and particularly for breeding sows which are sometimes inclined to become costive about farrowing time. Stock are very fond of molasses once they become accustomed to it, and this high degree of palatability makes it a useful addition to a ration containing less palatable foods. Molasses should only be given to pigs in small quantities at any time, for if it is fed carelessly severe diarrhœa may result.

When grains or other carbonaceous foods are not available cheaply, molasses may be used with success provided it is not overdone; the excreta of the pigs will give a good indication of when the safe limit is reached. Molasses should always be fed in combination with protein-rich foods such as milk or meat meal, as it supplies no protein to the animal.

Garbage.—Waste foods from private house, boarding-house, hotel, shop, cafe, hospital, and home can be put to good use through the pig which will change waste into edible pork with a fair degree of efficiency, and provided the business is properly founded and well conducted, garbage feeding of pigs can be a profitable undertaking.

The composition of garbage varies to such an extent that it is very difficult to say anything definite about its feeding value. Garbage which has been collected and kept fresh until fed to the pigs and which contains mostly bread, meat, fruit, and vegetables, and is free of foreign matter such as soil, cloth, paper, glass, &c., and which does not contain too much water, is a valuable food. Excessive amounts of water, fruit, and vegetables reduce the feeding value of the garbage.

Garbage feeding is usually carried on near to the cities and large towns by farmers who collect the food in water-tight containers either daily or several times weekly, and cart the food some miles to their farm; thus the greatest expense in garbage feeding usually is in the cartage which is done either by motor truck of horse-drawn wagon.

It is a general practice to boil garbage for an hour before feeding it to pigs. This is a safeguard against disease to some extent, and at the same time the cooking increases the palatability of most garbage. During the boiling, any excessive amounts of fat can be removed by skimming. When too much fat is given to the pigs they tend to become soft in the carcass, and so are unsuitable for the bacon curer or the pork butcher.

The addition of grain and green fodder to garbage improves the ration considerably. Weaners do not thrive on ordinary garbage and they should be given other more nourishing foods until they are about 60 lb. weight. Then the change to garbage should be gradual. Garbage containing fish should not be fed to pigs being grown for pork or bacon as the fish flavour is very strong and taints the carcass.

There is always an element of risk in garbage feeding for one never knows when some poison on injurious substance may find its way into the garbage, and result in the loss of a number of pigs. Swine fever may be carried through pigs eating the flesh of pigs suffering from swine fever. Salt poisoning occurs occasionally through brine from pickled meat being placed in the garbage for pigs. Pigs appreciate a little salt, but large amounts cause death.

TUBERCULOSIS IN PIGS.

Tuberculosis is an infective disease to which both men and animals are subject, cattle and pigs being the stock most susceptible to infection. The significance of the disease in the pig has yet to be fully appreciated by farmers engaged in the industry, observes a New South Wales departmental leaflet, which proceeds to impress upon pig-farmers the necessity for strict supervision of their methods of management.

There is no practical method of treatment of tuberculous in animals, it is pointed out, but attention to the following precautions the disease may be kept under control:—

1. As cattle are the main source of infection, the tuberculin test should be applied to the herd and all reactors removed.

2. Do not allow pigs to roam about pastures and yards used by cattle unless it is definitely known that there is no tuberculosis in the herd.

3. All skim-milk and other dairy products should be heated to 180 degrees Fahr. and kept at that temperature for fifteen minutes before fed to pigs.

4. All refuse, slaughter-house offal, and similar food should be boiled before it is given to pigs.

5. In view of the possibility of pigs gaining infection from poultry affected with tuberculosis, pigs should not have access to runs used for poultry.

6. Where tuberculosis is found to be present in the herd, all suspected animals should be slaughtered, and where this is done under qualified supervision the carcasses which have only a slight infection of the head glands will be passed for human consumption, the affected parts only being condemned. The pens should be thoroughly disinfected and limewashed, disinfectant being added to the lime. All litter and rubbish in the yards should be burned and the ground loosened and treated with quicklime.

7. In the case of stud pigs, if tuberculosis is suspected of affecting any of the animals, arrangements should be made to test the whole of the pigs. The reactors could then be removed.

Fresh air and sunlight are great enemies of the tubercle bacillus. Hence pens and sties should be open and airy, and have no damp dark corners to which the air and sun cannot penetrate.

Incubation and Brooding.

By P. RUMBALL, Poultry Expert.

When to Hatch.

ALTHOUGH incubation may be successfully practised throughout the year, the results obtained from the stock reared are not always satisfactory. It is generally conceded that the best months for hatching are July, August, and September. Heavy breeds hatched during the latter part of June and light breeds early in October will, in some people's hands, prove satisfactory. Chickens of any breed, provided the parent stock are in good condition, hatched in February and March also thrive, but unfortunately they commence production during the period of plenty, and generally moult at or about the same time as the chickens that were hatched and commenced laying six months earlier.

Selecting Eggs for Hatching.

Care in the selection of eggs which are to produce the future layers is essential. They need to be selected for (*a*) size, (*b*) shape, (*c*) texture of shell, and (*d*) colour.

Although like does not produce like with any degree of certainty, constant selection to a certain degree will tend to fix the qualities aimed for. Size is undoubtedly an inherited quality and one of the features which have an important bearing upon successful poultry raising. Breeding birds should be selected early in life for size of egg, as it is only by this means that a strain of fowls can be built up which will lay a good marketable egg in their pullet year. The eggs laid by the hen vary in size from day to day. This variation at times exceeds a quarter of an ounce, consequently in the selection of eggs for size it is not wise to make a 2-oz. egg the minimum weight. Aim at eggs which will average about 26 oz. to the dozen as there is always the tendency in breeding for egg size to diminish rather than increase.

Although shape does not materially affect the market value of eggs, a uniform article is desirable for marketing purposes. Misshapen eggs invariably are poor hatchers, and for this reason also should be discarded. In all table-top machines the heat is radiated from above the eggs with the result that there is a greater heat 1 inch above the egg tray than 1 inch below. In some types of machines the difference is as much as 6 degrees. As the embryo of the egg always finds its way to the uppermost surface of the egg it will be readily seen that large eggs will hatch much earlier than small eggs, and that to obtain even hatches only eggs of uniform shape and size should be used.

Texture of shell varies considerably with the feeding and general condition of the stock, but it is also possible for this feature to be hereditary. Apart from this uniform shell structure makes for improved hatches, and eggs with shells of poor texture should be discarded. Colour of shell is not an important feature upon the local markets, but from light breeds white-shelled eggs should be produced and from heavy breeds brown-shelled eggs. It is suggested that no harm would be done by trying to maintain these characters—in fact, with brown-shelled eggs the deeper the brown the better the appearance.

Keeping Eggs for Hatching.

Eggs required for hatching purposes should not be kept for a longer period than ten days. If they were set five days after laying better results could be expected than when they were ten days old. It is, however, necessary to keep them sometimes longer than five days and occasionally even longer than ten, therefore they need to be kept under the best conditions. A uniform cool temperature is desirable, one slightly under 60 deg., if possible. The room where they are stored should be dry and not moist. Although fresh air is desirable, direct currents of air are detrimental on account of the drying-out effect they have upon the egg. A good plan is to store them in strawboard fillers in cases. This prevents, to some extent, the undue drying out of the moisture content and facilitates the daily turning of eggs that are to be retained for any period. All that is necessary is to rest the case every alternate day upon a different side. The necessity of turning is due to the fact that the germ cell always comes to the uppermost surface of the egg, and if left undisturbed would stick to the membranous lining of the eggshells.

Methods of Incubation.

Incubation may be practised either by natural or artificial means. The necessity of having chickens hatched at certain periods of the year and the constant improvement that is taking place in our commercial flocks makes it increasingly difficult for the poultry raiser who desires to keep a 100 or so good-laying hens to use the broody hen, consequently artificial methods of incubation are resorted to by 90 per cent. or more of poultry raisers.

The period of incubation of eggs varies considerably. With hens it is 21, English ducks 28, Muscovy ducks 34 to 35, geese 28 to 30, and turkeys 30.

Natural Incubation.

When the hen is used for hatching purposes she generally finds her own nest. The best plan is to allow her to continue using it, merely protecting her from rough weather and preventing other birds from laying in the same nest. Her eggs, however, should be removed and replaced with eggs which came from the best of stock, failing this there would be rapid depreciation in the productivity of the stock. As she is expected to remain on the nest for a period of three weeks and will not make free use of the dust bath, she should have a dusting with some insecticide prior to the eggs being placed under her and another a few days before the chickens are due to hatch.

Red mite or tropical mite is possibly one of the most common and irritating parasites that trouble poultry. They multiply very rapidly when unchecked, and a sharp lookout should be kept for their presence, for if allowed to infest a broody hen the irritation will often cause her to leave the nest. Scaly leg is also a condition which should be avoided with the broody hen. The scale is caused by a parasite which may infest the legs of chickens very soon after hatching and result in an increasing number of birds with that unsightly leg. Not only is such a leg unsightly, but the parasite is detrimental to the development of the young.

The number of eggs to be set under a hen varies with her covering capacity. She should never have more than she can comfortably sit upon. The broody hen turns her eggs at frequent intervals, and those

in the centre will eventually find their way to the outside of the nest. If the hen has more than she can cover the outside eggs become chilled, and owing to the hen's action in turning the majority would in time become chilled and the embryo destroyed. The hen should be fed exclusively upon grain, and have plenty of dry grit and water before her at all times. The best results will then be obtained by leaving her as much as possible to herself.

A good and economical lice powder may be made up of the following ingredients:—One and a-half pints of petrol, a half pint crude carbolic acid, and plaster of paris.

First mix the carbolic acid and petrol, then stir in slowly the plaster of paris. Only use enough of the plaster of paris to take up all the liquid. Spread the moisture upon paper to dry out, and then store in airtight tins or jars. A small tin with holes punched in the lid is an efficient and economical means of distributing the powder through the feathers of the bird.

Location of an Incubator.

The incubator should be set up in a room where there is as little variation in temperature as possible. If a special room is to be built it should have two roofs with a space of 6 inches to 1 foot between each. The outer roof should overhang several feet on all sides. Such a roof permits of a free circulation of air between them and prevents an undue increase in room temperature by the rays of the sun when overhead, and the overhang protects the walls. If it is found that late in the spring the overhang is insufficient protection from the afternoon sun, a curtain can be suspended to afford greater protection.

Ventilation should be provided by windows and adjustable vents in the inner roof and bottom of the walls. These can be operated according to the number of machines working in the room and the outside temperatures. Direct draughts, however, should be avoided. Where it is not desired to go to the expense of building a special incubator room, an enclosure may be made under the majority of dwelling-houses. If it is situated under the centre of the house it is well protected from the sun and the temperatures are therefore fairly uniform. When the incubators are so situated it is essential that insurance companies be notified.

Heating of Incubators.

The majority of incubators are heated by kerosene lamps. The lamps should be thoroughly cleaned daily, and the burner boiled in water, to which washing soda has been added, after each hatch. New wicks should be used for each hatch. In starting, do so gradually. If a large flame is used when first warming up the machine it frequently leads to smoking of the lamp. A good grade oil is essential, and in adjusting the flame turn it up a little higher than necessary and then reduce to the desired height. This action makes the last pull upon the wick down and guards against a flame running up. Wicks of a correct size are essential.

The lamp should be cleaned and filled early in the afternoon. By doing this at this period all char is removed ensuring the maximum heat from a given-sized flame during the cold night, at the same time the operator has ample time to make the correct adjustments before retiring for the night. In trimming the wick do not use scissors. Rub off the

charred crust with a match and thoroughly clean the hands before handling eggs, otherwise the eggs may become smeared with oil, with the resulting injury to the embryo.

Beginning the Hatch.

Heat up the machine a couple of days before eggs are to be set, and after the machine is thoroughly warmed up commence to adjust the regulator. When the operator is sure that the regulation is correct the eggs may be set. This is better done in the morning so that the eggs will be thoroughly warmed up before nightfall, as it is asking a little too much of the heating ability of many machines to warm up cold eggs and maintain the correct temperature during a cold night. When the eggs are placed in the machine the temperature will fall. After a time the regulator may be lifting and the correct temperature not showing; this is due to the thermometer being nearer the eggs than the capsule which is affected by the coolness of such to a greater degree. The regulation should not be interfered with, as when the eggs are thoroughly warmed, if adjustments have been made carefully in the first instance, the damper will only lift in the event of excessive heat. Once having adjusted the mechanical regulation, any further regulation should be made by the flame, as regulators have their limits and it is unwise to place undue strain upon them.

Thermometers.

All thermometers should be tested prior to the commencement of every hatch, and again at any time that you cannot reconcile the actions of the regulation system with the temperatures. This can be done by placing a clinical and incubator thermometer in a basin of water and gradually increasing the temperature until the clinical thermometer reaches a temperature of 102 deg., and then observe the temperature indicated by the incubator thermometer. If there is any difference, the necessary allowance can be made. If it is expected that there is any serious fault in the incubator thermometer, and no clinical thermometer is available for testing purposes, the bulb can be placed under the tongue. It should read then 98 deg. This method is not as accurate as that described, but it will indicate serious trouble. Incorrect thermometers have been responsible for many poor hatches, and even new purchases may not prove correct.

Temperature.

Temperatures at which incubators are to be operated vary with the position in which the thermometer is situated in the machine. The heat of table-top incubators comes from the top of the machine, consequently the higher in the machine the bulb of the thermometer the greater the temperature shown. The correct temperature when the middle of the bulb of the thermometer is on a level with the top of the eggs is 102 deg. A thermometer hung with the bulb free of the eggs should read about 103 deg.

The heat within the machine is controllable by capsules or thermostat. Occasionally these get out of order by the former leaking or by the latter becoming bent. Very little can be done for a bent thermostat, but capsules may be repaired. The capsule system of regulation is that most commonly used. The capsule is a thin metal container filled with alcohol and ether. This capsule expands with

heat bringing into play the regulating device, allowing surplus heat to escape from the egg chamber, or preventing the intake of heated air. If the capsule is thought to be faulty and difficulty is encountered in regulating the machine, it can be tested by placing it into warm water for a few seconds. If expansion takes place it will prove that the capsule retains some of the liquid, and if no escape of gas can be detected by smell it is reasonable to assume that it is in good order.

During the course of the hatch the temperature will increase slightly, and just prior to hatching may go as high as 104 deg. This extra temperature is due to the increase in animal heat of the developing embryo, and need cause no worry unless it is excessive.

Turning.

Begin turning the eggs at or about forty-eight hours after setting and continue to do so twice daily until the nineteenth day. Occasionally, if the temperature has been a little too high, the eggs will pip on the eighteenth day. When this is the case, turning should cease as the chicken has put itself in a position to release itself from the shell.

When the eggs are placed upon the egg tray, set them at an angle of about 45 deg. with the large end up. To turn these it is necessary to handle every individual egg unless patent turning devices are used. This may be done by simply pulling the egg over upon its small end to the other side. After testing, turning may be done by gently moving the eggs over with the palm of the hand. Complete turning is not essential. All that is necessary is a movement sufficient to make the embryo seek another position in order to prevent sticking to the shell lining.

Cooling.

Cooling is a method of giving the eggs a thorough airing with the consequent strengthening of the embryo. The necessity of airing varies with the make of machine on account of the variation in the supply of fresh air. It is, however, important to remember that for the first seven days very little airing is required, and that the young embryo is very subject to chill. The time it takes to turn the eggs is sufficient. After the first week the eggs may be kept out of the machine until they have lost that burning heat. The period necessary will vary with the stage of development and the outside temperature. A good plan is not to cool the eggs to that degree that the correct temperature in the machine cannot be regained within an hour. In airing, place the eggs upon a table. Do not allow any portion of the tray to overhang, otherwise some of the eggs may become chilled owing to the greater circulation of air. Airing should be practised up until the nineteenth day, but if the eggs are then chipping they should not be aired.

Testing.

This should be done upon the seventh day. It may be done earlier, but the time necessary to do so may result in chilling; furthermore, the germ at an earlier age is not pronounced, and in brown-shelled eggs it is almost an impossibility to discern it unless a powerful light is available. All infertile eggs and dead germs should be removed. This practice gives more room in the tray, facilitates turning, and avoids live eggs being affected with the colder infertile egg. To test, a piece of cardboard having a hole in it similar in shape to that of an egg but

slightly smaller and a lamp are necessary. The cardboard is held up to the light and the egg placed against the hole in it. An infertile egg will be perfectly clear, a fertile egg will have a dark movable spot, about the size of the head of a match, with numerous blood vessels radiating from it, while a dead germ will show as a blood ring or streak, and generally stationary.

Ventilation and Moisture.

These are both interlocked. If a machine has a rapid circulation of air through it, it will require more moisture than a machine in which the circulation of air is slow. The reason why moisture is supplied is to prevent a too-rapid evaporation of the moisture content of the egg. Undue evaporation of the egg content is detrimental to good hatches and to the correct development of the embryo. Enlargement of the air cell naturally takes place due to the evaporation of the moisture content and the escape of carbon dioxide through the shell. This enlargement can easily be judged when testing, and if too great restrict the air circulation or increase the moisture content of the air passing through the machine. The reverse would be necessary if insufficient enlargement was not taking place. Many machines are supplied with moisture trays. These should be filled at the commencement of the hatch and kept filled throughout. When moisture trays are not supplied the air, which passes through the machine, carries sufficient moisture at times. If it is necessary to increase the moisture content of the air taken in by the machine the floor of the incubator room can be moistened; this may have to be done daily in some climates.

Good ventilation is equally essential for the growth of the chicken within the egg as it is for the development of the chick when hatched. Without oxygen the changing of the egg content into a lusty chicken is impossible. If a fertile egg is examined upon the seventh day a network of blood vessels can be seen near the shell. The blood stream not only converts the food into the embryo but it carries off the waste product (carbon dioxide), and without a good circulation of air this poisonous gas is not removed sufficiently fast, and consequently has a weakening effect on the developing chicken. It will be understood that the more advanced the embryo is the greater is the need for oxygen and greater will be the amount of carbon dioxide given off; therefore, what will be the correct ventilation for the first few days will not suffice when the eggs are in the third week of development. The increasing of the ventilation at this period will also assist in the regulation of the temperature of the incubator. Again, when the chickens hatch, ventilation should be increased, and if the chickens are noticed panting the door of the machine should be left slightly open.

The Hatch.

After the last turning, on the nineteenth day, close the incubator and do not interfere with it until the hatch is over unless something unforeseen occurs. When the chicks have dried off give all the ventilation possible, darken the doors to prevent picking at the droppings or the toes of one another. It is as well to let them remain under these conditions for twenty-four hours, after which they may be removed to the brooder.

Disinfection.

Immediately the chickens have been removed from the machine it should be thoroughly cleaned and disinfected. A good disinfectant is

formalin. Any other good coal tar disinfectant may be used. The machine should then be closed up, and when dry opened and thoroughly aired before being used again.

Brooding.

Artificial brooding of chickens is a difficult process with an inefficient plant. The object of the breeder is to keep the chickens warm and comfortable and to wean them from heat as quickly as possible.

A good illustration of the requirements of brooding is given by the hen. She regulates the heat to the chicks under her care according to the age of the chick and weather conditions. If the chickens are young she moves about very little and sits fairly close and gradually increases her ranging habit as the chicks develop. Upon a cold wet day it will be noticed that she collects her brood frequently and warms them up.

In artificial brooding similar principles have to be followed with this difference—that the chickens have to be trained to do for themselves what the broody hen encourages.

Systems of Brooding.

Two systems of brooding are in common use in the State—namely, what is known as cold brooders and heated brooders. In both systems many types of brooders are used.

Cold Brooders.

The term cold brooding is a misnomer. Artificial heat is not supplied, but the heat of the body of the chicken is retained by means of cloths or flannel and a restricted circulation of air. This system of brooding has been practised for many years, but it is only in comparatively recent years that it has been used to any great extent by commercial poultry farmers. The illustration of the cold brooder will convey the nature of their construction. The cold brooder can be operated in brooder houses or rearing pens with an equal degree of success. Although the writer has operated the cold brooder with apparently equal results to the heated brooder, the latter is favoured. It can well be understood that the placing of chickens that have travelled a day or so under a cold brooder, which has to be warmed up with their own bodily heat will not be attended with as good results as would be the case if they were put under a heated brooder. Also, that in cold, bleak weather the heated brooder would offer greater advantages than the cold.

Heated Brooders.

There are many types of heated brooders, but they can be referred to as the box, the colony, and the battery. The former system is not used to any extent in this State. This, in the first instance, may be due to the cost of installation of a suitable type, and secondly to the general satisfactory results from the colony system.

Colony Brooder.

Where large numbers of chickens are to be reared the colony brooder appears to be the most economic, with the exception of possibly the newer system known as the battery, and as effective as any other type. With this class of brooder several hundreds of chickens can be run together with little more trouble and attention than would be

PLATE 151.—COLD BROODERS.
Showing numerous Cold Brooders being operated in a continuous house. Brooders taken from the house daily and placed in sun to air.

required for a lot of 100 under any ordinary brooding system. This system also permits of a very much freer movement of chickens once they have been educated as to the source of heat, and assists in the retention of that keenness in life that is essential to health and growth.

Five hundred chickens should, however, be the limit in any one colony brooder, but possibly 100 less would give better results. It is also generally a sound rule to depreciate the capacity claimed for brooders by most manufacturers.

The colony brooder consists of a heater with a metal hover for the purpose of deflecting the heat. The fuel used may be coke, sawdust, kerosene, or electricity. Whatever type of colony brooder is to be used should be housed in a special brooder house. It is possible to operate them in open-fronted houses by cutting off ground draughts, but it will be readily understood that when such is the case considerably more fuel is used. In the case of kerosene and electric-heated brooders the increase in the costs of heating in open-fronted houses would be considerable. With the sawdust and coke brooders costs are not excessive, but the great disadvantage with operating in open-fronted houses is to keep the heat at a uniform temperature. It is found in practice that they will burn out within a period of twelve hours and in some cases less with the consequent chilling of the chickens.

A suitable sized building to house a 500 colony brooder would be one that measured approximately 14 ft. by 16 ft. and at least 6 ft. high. The roof may be either a hiproof or skillion, the building lined and ceiled and provided with ample light. It should be built to face north-east or north and arranged so that the sunlight can be freely admitted. Lighting through glass is desirable in bad weather, but direct sunlight is essential to admit of the ultra violet rays. Failing this cod liver oil is an essential to all chicken-mashes, in order to supply Vitamin D. A few weeks of brooding without sunlight or cod liver oil would soon result in leg-weak chickens. Sunlight is the cheaper.

The house may be built of timber or iron. Iron is to be preferred, being of a more lasting nature and offering less harbour for vermin. The lining and ceiling should, for preference, be of $\frac{5}{8}$-inch, tongued and grooved pine, but for economy wheat sacks sewn together and whitewashed will serve. The floor should be concreted to facilitate cleaning, and a thin concrete wall sunk into the ground to a depth of 18 inches. This wall prevent rats burrowing under the floor.

Battery Brooding.

This system of brooding is comparatively new to Queensland. It consists in the brooding of chickens under very intensive conditions with the practice of the maximum sanitation. The chickens are never allowed to run upon the ground. Day and night they are kept upon small mesh wire. This permits of the droppings immediately they are voided falling upon a tray situated so that is may be conveniently cleaned. Food and water are placed outside the brooder and the chickens fed through bars or netting according to the construction of the brooder. The food and water being in such a position that they cannot be fouled, and as the droppings are never upon the floor of the brooder, it is almost impossible for chickens to obtain disease producing organisms from other chickens.

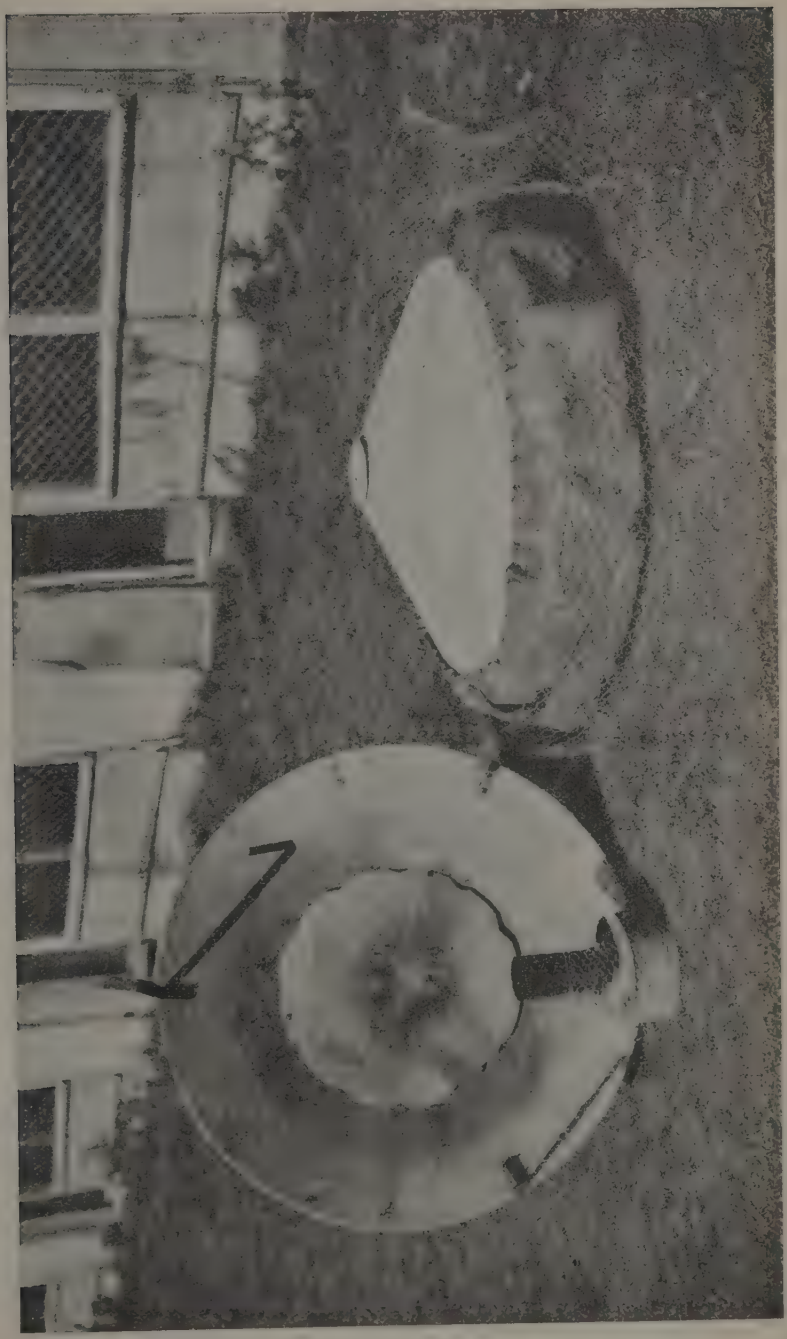


PLATE 152.—A KEROSENE-HEATED COLONY BROODER.
Showing curtain of hessian and wire for restriction of range.

The illustration is that of a home-made brooder which meas 3 feet by 6 feet. In this particular make there are two tiers. floor is ½-inch netting and the dropping tray galvanised iron. sides are movable. In the early stages of the chicken's life 1- netting is used, and as development takes place 1½-inch netting. chickens obtain their feed and water from the troughs by passing t heads through the netting. When the chick is very young the tro is tilted to facilitate feeding, and as development takes place low to a level position. This is done by a small wire hook which is attac to the tray.

This class of brooder has to be heated. In this case a small keros lamp is set up in half a kerosene tin under sleeping compartm This tin only reaches to within 1 inch of the netting floor, consequen there is no one part of the floor excessively heated. Retention of h is obtained by having a hessian curtain in front of the sleep compartment and a hessian pillow filled with straw on the top. T pillow is kept low during early life and raised as the chickens gr Naturally, ventilation must not be restricted to too great an exten

The writer has seen chickens kept in this type of brooder u they were eight to ten weeks of age with no apparent ill effect. T are, however, naturally soft due to lack of exercise, and breeders well advised to get them out of the brooder much earlier. When t are four to six weeks of age it should be possible to wean them fr the heat in a manner similar to that used in other types of brooding

It has been frequently noticed that chickens removed from batt brooders have been effected shortly after removal with coccidios Mortality due to this disease has appeared to be greater upon the sa farm with this class of brooded chicken than with any other. It h been suggested by some authorities that this is due to the hea infestation with the organism responsible for the disease in stock t have little resisting power. Whatever the cause it demonstrates th although chickens have been protected from the disease early in life being battery brooded that they are still subject to an attack.

Temperatures.

In heated brooders temperature is a very important factor. insufficient heat is supplied the chickens crowd together. The corr heat is the only method by which this can be prevented. Overheati is also to be avoided on account of its weakening effect and the difficul that will be experienced in weaning from the brooders. The gene comfort of the chickens is a sure index that the temperature is fair satisfactory, and if the droppings are well distributed under and arou the hover in the morning, it is proof that the chickens have been fair comfortable. When the chickens are first put into the brooder th come from a nursery in the incubator which generally has a temperatu of at least 90 deg., and it is as well to start your brooders at th temperature, gradually reducing it until heat can be dispensed wi in from four to six weeks.

The importance of heat in brooding chickens has been demonstrat by investigators at the Michigan State College. Working with chicke from diseased free stock with a range of temperature from 72 to deg. during the first week of brooding they experienced mortalit from 37 per cent. to 5 per cent., and with diseased stock 57 per cen

PLATE 153.—A SAWDUST-HEATED COLONY BROODER.

Showing fire bucket filled with sawdust which is fitted into the cylinder on right. Note core in centre of bucket for draught.

to 32 per cent. These experiments were conducted over a period of two years and amply illustrate the importance of temperature.

Ventilation.

With some types of brooders many chickens are lost due to lack of ventilation, and to overcrowding. Brooders which are usually made to hold a 100 day-old chickens are generally too small for the same number of chickens a week old. It frequently happens also that the attendant makes no allowance for additional ventilation with the growth of the chickens, and although he has been successful in rearing them to the age of one week they then start crowding and dying. The lack of ventilation has a great weakening effect on both young and old stock.

PLATE 154.—A COKE-HEATED COLONY BROODER IN USE.

It causes the young to crowd, and renders the older birds more susceptible to disease. When chickens have crowded they present a wet appearance in the morning, to which the term of "sweating" is applied. Sweating is not the cause. The wetness is caused by the condensation of the moisture content of the breath which would have been carried away if proper ventilation had been provided. Chickens which have been overcrowded rarely recover from the ill-effects, and it should be avoided at all costs.

In brooding under any system the following are essential points:—

(1) **Limited range, increasing with age.**

(2) Sufficient heat, which should be reduced as early as possible.

(3) **Ventilation, which should increase with age.**

(4) Correct accommodation. What is just enough room for 100 day-old chickens rapidly becomes too little as they grow.

(5) **Never attempt to brood chickens of mixed ages.**

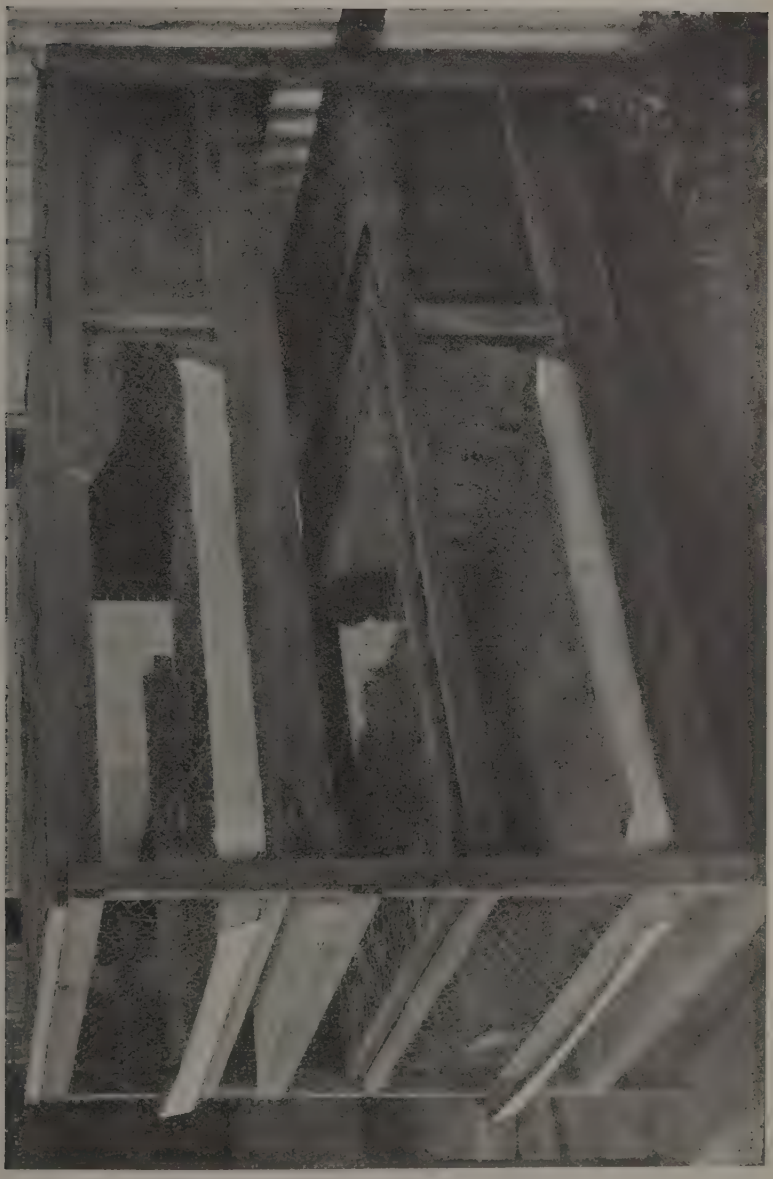


Plate 155.—Home Made Battery Brooder.
Showing Simplicity of Construction.

Placing Chickens in Brooders.

When chickens are placed in brooders the floors should have a light dressing of sand or soil to absorb any excreta and to give the chickens a good footing. A small amount of litter in the nature of soft straw or chips will provide exercise and tend to keep the chickens active and prevent vice.

With both hot and cold brooders their liberty should be restrained for a start. This can be done by erecting a barrier of wire netting around the brooder increasing the area day by day. At the end of about one week they can be given the liberty of the brooder house. With the cold brooder the netting should only allow a range of two or three inches for the first day. With the colony brooder the range will depend upon the heat given off by the brooder.

What is necessary is to educate the chickens as to the source of heat, and when this is done to encourage them to take as much exercise as possible by ranging over the entire brooder house.

Most breeders have outside runs to their brooder houses, and the chickens are allowed out in them after they are about a week old. Outside runs are not essential if the brooder house is constructed to permit of abundance of light and sunshine. However, when runs are provided the chickens should be driven in after they have been out for an hour or so upon the first occasion. They may be allowed out again in the course of an hour or so. This should be repeated in order that the chickens will learn to return to the brooder house and avoid to a large extent the possibility of their being caught out in a rainstorm or staying out too long and becoming chilled.

Sanitation.

Cleanliness in every operation is essential; unsanitary conditions not only pollute the atmosphere of the brooders but are frequently the cause of the rapid spread of serious diseases in baby chickens. In very young chickens bacillary white diarrhœa is responsible at times for heavy mortality. The chickens are very subject to this disease within the first ten days. The organism responsible is voided in the excreta, consequently it will readily be understood that a few diseased chickens could be responsible for the spread of the disease among the whole brood. This fact emphasises the advisability of the destruction of apparently sick chickens and the regular and frequent cleaning of brooders.

Coccidiosis, another disease to which chickens are subject, is spread per medium of the droppings. With the former disease some disease effected chickens are the result of effected parents and when hatched are already diseased. With coccidiosis the chicken contracts the disease after hatching. Many adult birds are affected with coccidiosis. The organism is, therefore, easily carried upon the feet of the person attending them to the brooders. Strict sanitation and the application of precautionary measures gives reasonable assurance of protection against the disorder. Brooder houses should be cleaned out every second day and the sleeping quarters daily.

Weaning.

When chickens are from four to six weeks old it is generally necessary to remove them from the brooders to make room for others.

This is also necessary to protect the soil from becoming too foul and the chickens too soft by prolonged supply of heat. Correct brooding will materially assist the weaning process as the heat should have been gradually reduced.

The chickens were trained in the early stages of brooding and training is again essential. Poultry are largely creatures of habit and can generally with care be trained to act as required. When once they form a habit—good or bad—it is difficult to alter. A little time spent in seeing that chickens take to their new quarters during the first few nights will amply repay the poultry keeper, and prevent losses that occur when growing chickens crowd into corners, &c.

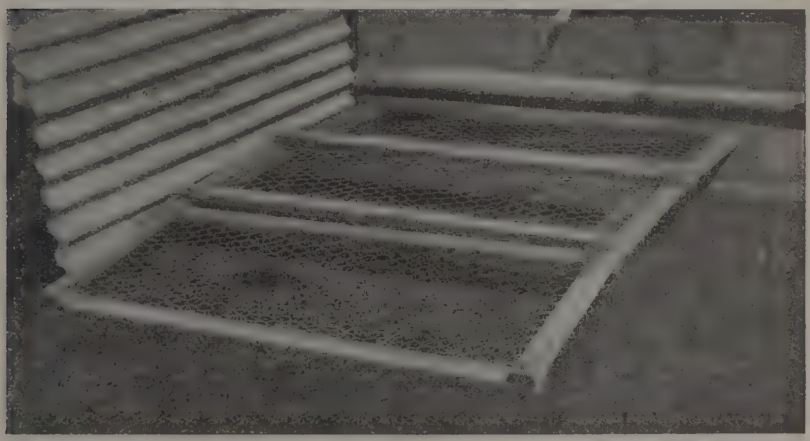


Plate 156.
Weaning Platform as Described in Text.

Chickens may be placed in permanent laying quarters or colony houses when they are to be weaned. The permanent house may be an intensive laying shed or a special colony house. The colony house is an ideal system provided they are situated upon clean land, or in other words land not contaminated with the droppings of adult or diseased birds.

Colony houses can be built upon slides or wheels and moved about the fields or made fixtures. Hurdles or netted yards are necessary to confine the chickens to a certain area until they become accustomed to their new quarters. After a week or ten days these hurdles may be removed, and providing the rearing houses are not too close to one another, the chickens belonging to the various lots will not become mixed returning to their own quarters at night.

The number to be put out together, of course, varies with the accommodation available, but larger flocks than 100 are not recommended; 50 would be safer.

A good rearing house for 100 chickens should be at least 10 feet long and 8 feet deep, this, of course, with free range. The house should be 5 feet high at back and 6 feet high in front. Ventilation should be provided by leaving a space between the top of the back wall and

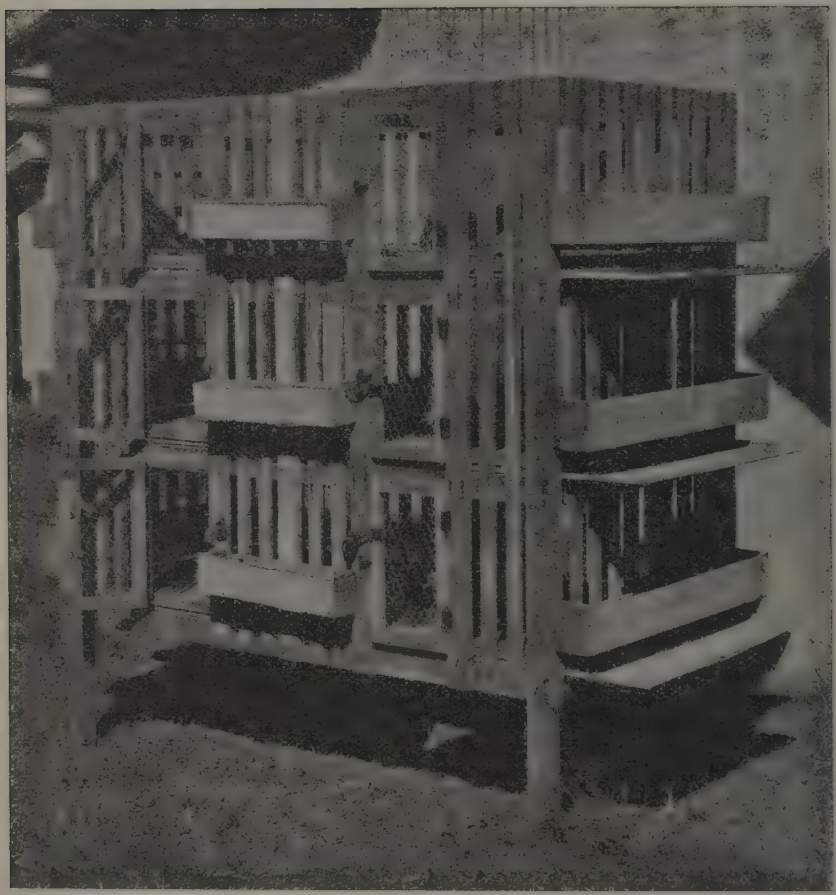


PLATE 157.
BATTERY SUITABLE FOR THE RAISING OF COCKERELS AFTER LEAVING THE BROODER.

roof of 3 inches. As a protection from the south-easterly weather at least 4 feet of the eastern front end should be covered with iron. The front should be netted and provided with a gate in order that the birds can be shut in overnight as a protection from foxes, &c.

General Management.

When the chickens are taken from the brooder quarters and placed in houses to be weaned they are too young to perch of their own free will. Various arrangements have to be made to prevent crowding. Some breeders bed them down on straw. The straw needs to be fairly deep and loose and well heaped up in the corners of the house. The chickens appear to be content to snuggle in the straw instead of making warmth by crowding together. It is then only necessary to go around in the evening with a fork and loosen the straw up. In the shaking the droppings fall on to the floor and are readily cleaned up. With this system of weaning, perches must be erected later and the birds allowed to take to them at will.

Another system of weaning and one that educates the bird to perch at the same time is to erect a wire netting platform about 6 inches from the ground with a netting run up. On the top of this frame several strips of 2" by 1 timber are attached. The chickens at night are not allowed to rest anywhere but upon this platform. They certainly crowd together for a start but soon spread out. The netting allows for a circulation of air and they experience no ill-effects. It is necessary to watch the chickens for the first few nights, but immediately they have settled down they can be left.

In erecting this platform it is essential to make it the full width of the house and at the closed end.

The thinning out of chickens as they develop must be practised. No hard and fast rule can be laid down as to when this thinning out should be practised as the work is dependent upon the space available.

With leghorns, if it is not intended to rear the cockerels for stud or table purposes, many could be disposed of at about three weeks of age. This will reduce costs and give the growing pullets more room. With all breeds it is desirable to separate the sexes as early as possible, and where males are to be grown for market purposes to place them under very intensive systems of housing, and to feed them with the object of obtaining the maximum growth in keeping with costs.

Young stock that do not appear to be thriving should be destroyed whether they be cockerels or pullets, as it is little use trying to make a satisfactory producer or table fowl out of an apparently unfit chicken.

TO SUBSCRIBERS—IMPORTANT.

Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the Journal to the subscribers concerned.

It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.

Marketing Oranges at Home and Abroad.

By JAS. H. GREGORY, Instructor in Fruit Packing.

PART I.

MARKETING oranges successfully at payable prices is now, through the tendency towards over-production in Australia, becoming an ever-increasing problem. Growers, in order to get the best prices for their fruit, should spare no effort in trying to attain the perfection of pack and "get-up" which will command top market prices. To do this it is necessary to take the utmost care in harvesting from the trees, and, when in the shed, in sizing and grading for quality; in the selection of the type of case and case timber; and finally in the labelling and stencilling. The fruit should be graded most carefully for quality.

Harvesting.

When the fruit appears to be ready for harvesting and sending to local markets, growers should make a test of a few specimens before finally deciding to pick. The test should show if the fruit will conform to the standards of maturity laid down in the Fruit and Vegetables Act administered by the Department of Agriculture and Stock, Queensland. If exporting overseas it is necessary to conform to the standards set by the Commonwealth Export Regulations, or if sending interstate to conform to the regulations of the State concerned. To make the test, specimens should be selected from trees in different parts of the grove, so that an average sample for the grove is obtained.

When the fruit is found to have matured, growers may go ahead with their harvesting. They should select only the largest sizes, for this allows for the packing of the most popular sizes, as well as ensures the highest standard of maturity. It has been found that large-sized fruit usually tests better for maturity than small-sized fruit. In picking it is usually better to make two clips—one to remove the fruit from the tree and a second to remove, if any, the surplus stalk. Gloves should be worn while handling the fruit to avoid finger-nail damage.

The best type of clipper is the blunt, parrot-nosed type. Picking bags, which are not recommended, if used, should be used with great care, as they are often a source of great damage to fruit when carelessly handled, causing stalk rubs, which add to the chance of mould infection. It will be found that baskets, or kerosene tins cut lengthwise and provided with handles or straps to place around the shoulders, are most satisfactory for harvesting. Fruit should never be tipped or rolled into the harvesting boxes. Care should be taken to see that in the cases or picking containers there are no projecting nails or pieces of wood that could cause damage to the fruit.

Whilst picking, a preliminary sorting or grading for quality should be made. This can be done by having the picking cases at central points in the orchard and grading the fruit into boxes as it is handled from the picking tins to the cases. Three grades should be made—i.e., "Special," "Standard," and "Factory."

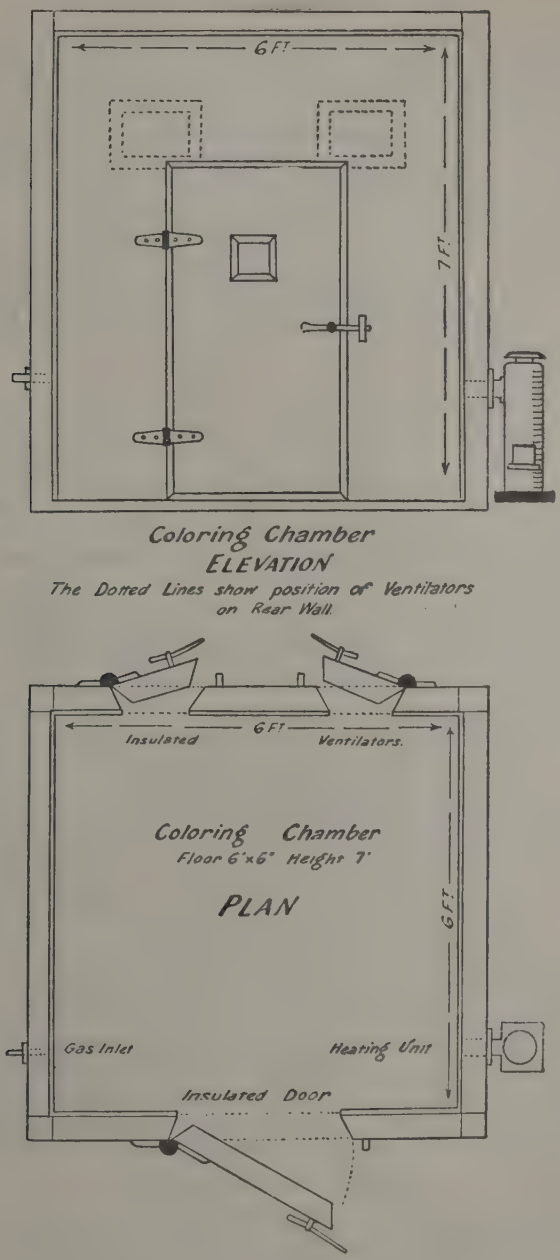


PLATE 158.

Plan and Elevation for Colouring Chamber.

Note.—The placing of the door with its inspection window and ventilators, which should be made as gas-tight as possible. Provision is also made for artificial heat and the application of the gas.

Colouring.

The appearance and value of fruit is enhanced by colouring. Only matured fruit will respond satisfactorily to the process of artificial colouring, immature fruit will not attain the rich colour so admired on the market. The Ethylene gas process has been found to give great satisfaction. Acetylene gas has also been used with success. It is necessary with both of these processes to have a gas-tight chamber to hold the fruit in whilst applying the gas.

Ethylene Gas Process.—Ethylene gas is procured in cylinders. The temperature for oranges during the colouring process is best kept at about 75 deg. Fahr.; this is different from lemons, which should be kept at 65 deg. The fruit is placed in a gas-tight chamber and the gas is injected, the quantity being one cubic foot of gas to each 1,000 cubic feet of space in the room. A gauge is attached to the cylinder for measuring the amount of gas for each application.

The best method of placing the fruit in the chambers is by using flat trays containing a single or double layer of fruit which will allow of free access of gas to the fruit. If these prove too expensive, growers can use cases which should be made on the flat and have the boards well spaced apart. The bottom layer of trays or cases should be placed on battens spaced on the floor of the chamber. It is recommended that the same cases be always used for the colouring process, as they can then be kept clean and free from fungus infection. Spraying the chamber and cases occasionally with a 1 in 20 solution of formalin will assist in eliminating infection from moulds. In applying the gas nothing is gained by using a larger quantity than is necessary. After the correct quantity of gas has been applied at the correct temperature, shut off the gas and allow the room to remain closed for at least four hours. The chamber should then be opened and the fruit completely ventilated to renew the oxygen. This needs to be done as quickly and completely as possible in order to keep the temperature of the fruit from changing in any marked degree. It is of advantage to allow the fruit to stand without gas for one or two hours before recharging the chamber. Two applications per day are sufficient. The same method of application is sufficient, nothing being gained by recharging sooner than four hours after the previous application of gas. Oranges properly coloured by this process have a greatly enhanced appearance. If oil sprays have been used on the trees it is advisable to use care in colouring, as the skin of the fruit is inclined to burn through chemical reaction.

Acetylene Gas Process.—The same type of gas chamber as used with Ethylene gas is necessary. The method of application is similar in most respects to the use of Ethylene. The correct quantity of carbide to use is determined by the size of the chamber. One ounce of carbide generates sufficient gas for 75 cubic feet of air. Experiments conducted by departmental officers in Queensland give the following table for general use:—

Size of Chamber.	Number of Bushel Cases.	Air Space When Stacked.	Dosage.
Cubic Feet.		Cubic Feet.	Oz. Carbide.
200	40	150	2
200	20	175	2¼
200	10	187½	2½

A suitable container which permits the water to drip slowly on to the carbide should be used.

Nine to fifteen charges should give oranges a normal colour.

When using the Ethylene or Acetylene gas treatment with oranges the following points should be closely observed:—

Keep a temperature of approximately 75 deg. in the chamber.

Have fruit packed loosely in boxes or trays so that the gas has a free circulation around the fruit.

Stack the bottom layer on battens spaced along the floor of the chamber to permit a free passage of gas beneath the fruit.

Apply the correct quantity of gas according to the size of the room.

Allow the room to remain closed for at least four hours.

Open and ventilate the fruit as quickly as possible to renew oxygen.

Repeat the same process for further applications.

Remember that nothing is gained by overcharging or charging the chamber too often, so do not increase the cost by wasting gas in this way.

Care should be taken to keep all naked lights away from the room or gas cylinders when using the gas, as the mixture becomes dangerous when a large quantity of gas is mixed with air.

The following points must be strictly adhered to if the colouring process is to be of advantage to the industry.

Do not attempt to colour immature fruit, as it will not attain to a satisfactory product, being of a light and often dull colour which will not attract buyers.

Only perfectly dry fruit should be treated. Wet or damp fruit will scald severely and break down during transit to market.

Care must be taken that no oil or Bordeaux sprays remain on the fruit during treatment. Fruit not free of these sprays will become blotchy and unsightly during treatment.

Bruised areas on oranges will not colour properly.

All damaged fruit should be eliminated before colouring.

Remember artificial colouring will not increase the sugar content of oranges.

Building the Gas Chamber.

The building may be constructed of suitable timber, insulated and lined, or built of iron (which latter is hard, however, to make gas-tight). The process is done quicker and more efficiently with less waste if the chamber is made gas-tight. To make a gas-tight chamber, which means a large saving in the quantity of gas used, the space between the outside wall and lining boards should be insulated by filling with saw-dust, wood-shavings, charcoal, or other suitable material. This is also a big factor

in maintaining an even temperature. Paper-lining in addition to the filling is an additional improvement. In filling the cavity between the outside wall and the lining boards, trouble can be avoided by building the wall and lining at the same time and placing the filling in position as the wall is erected. As a sufficient supply of oxygen must be maintained in the room, it is necessary to change the air after every application of gas. To do this successfully ventilators should be placed at the opposite end of the room to the door. The door and ventilators (*see* Fig. 1), should be made as close-fitting as possible, and insulated in the same manner as the walls to obtain best results. By placing the ventilators at the opposite end to the door the air can be quickly changed in the room by opening both at the same time without causing any undue variation in temperature.

Temperature Control.

Heating to obtain the correct maximum temperature of 75 deg. Fahr. may be necessary in some climates, so provision should be made when building the gas chamber for the erection, where necessary, of a heating system. By building the room in a corner of the packing shed a more even temperature may be maintained, and in many parts of Queensland should make it unnecessary to install heating apparatus.

It should be remembered that, during warm periods, to help keep the temperature low, it is necessary to allow the fruit to cool before placing it in the chamber. A chamber 6 feet by 6 feet by 7 feet will hold fifty cases stacked loosely. Changeable climatic conditions will affect the humidity of the inside of the chamber. If the oranges show signs of withering during the colouring process, it will help to stop this withering if the humidity is increased by placing a dish of water or wet bags in the chamber. To avoid opening the chamber unnecessarily the thermometer should be placed in the chamber where it can be seen without opening the door. A small window built in the door will allow of easy observation of the thermometer and interior of the chamber.

Packing for Market.

Types of Cases.—Both the Australian Dump Case, internal dimensions 18 inches long by 8⅝ inches wide by 14¼ inches deep, and the Canadian Standard Case, internal dimensions 18 inches long by 11½ inches wide by 10½ inches deep, are excellent containers. Both of these cases lend themselves admirably to the count system of packing. Such cases as the Long Bushel and other types of cases have not the same satisfactory features. Cases of the Long Bushel type do not permit of easy packing, being too narrow, causing skin damage to the fruit through rubbing on the side of the case whilst being placed in the bottom layers. The quantity of fruit touching the wood is also a source of increased damage through pressure and vibration whilst in transit. These cases, being narrow, do not lend themselves to standard-count packing, variation in the type of pack having to be used, making it practically impossible to have a definite system of standard counts for buyers. Most packs in cases of this description give the impression that the cases are only half-filled owing to the large number of packs with large spaces showing between the fruit. Buyers, seeing this and not knowing the number of fruit in the case, inevitably cut the price to safeguard themselves. Growers should insist on cases cut to the correct size and are well advised not to make up cases if the boards, when nailed

to the ends, have spaces between them of more than one-quarter of an inch. Spaces wider than this are often the cause of cutting the fruit on the side of the cases whilst in transit. It pays to use only a first grade milled case.

During visits to orchards many growers are found who do not make their cases correctly, thereby making it harder to do the standard packs required on the market. Another grave fault found is the bad milling of some of the boxes, causing the sacrifice of the essential features which make a particular type of box a success. A particular instance of this is the Standard box used for citrus fruits and apples. We often find that millers cut thick tops and bottoms for this box thereby precluding any chance of the packer putting a correct bulge in the case without damage to the fruit. The correct internal dimensions of each case will be given, together with a few remarks on the various features in the making up. I will not give the length and breadth of boards as these vary with the thickness of the ends of the case and the particular type of timber the case is milled from.

Australian Dump Case.

(18 inches long by $8\frac{3}{8}$ inches wide by $14\frac{1}{4}$ inches deep.)

Thickness of ends—Minimum, $\frac{3}{4}$ inch.

Thickness of sides—Minimum, 5-16 inch.

Thickness of lid and bottom: $\frac{1}{4}$ inch exact.

Use $1\frac{1}{4}$ inch nails for sides, $1\frac{1}{2}$ inch for tops and bottoms.

Canadian Standard Case.

(18 inches long by $11\frac{1}{2}$ inches wide by $10\frac{1}{2}$ inches deep.)

Thickness of ends—Minimum, $\frac{3}{4}$ inch.

Thickness of sides—Minimum, 5-16 inch.

Thickness of tops and bottoms—Maximum, 3-16 inch.

Dimensions of cleats: $11\frac{1}{2}$ inches long by $\frac{3}{4}$ inch wide by 3-16 inch minimum thickness.

This case is made up with thin tops and bottoms to permit of a bulge of 1 inch to $1\frac{1}{2}$ inches in height to be placed on the top and bottom of the case; the thin timber permits this bulge without damage to the fruit. The cleats are used to be placed across the ends of the lids and bottoms (see Plate 159) to strengthen the thin boards and assist in the prevention of splitting. The thick sides are necessary as all cases are stacked on their sides when in transit.

Use $1\frac{1}{4}$-inch nails for sides and $1\frac{1}{2}$-inch nails for tops and bottoms.

The cleats (A.) are placed across the ends of the pieces of timber used for the tops and bottoms of the case and are not used in the position indicated by the dotted lines (B. and C.). If growers are supplied with a case with two-piece ends it is suggested that corrugated fasteners (D. and E.) be used instead of the cleats (B.) indicated. Two fasteners (D.) to join the two pieces should be placed on one side of the end about 1 inch from either edge, and one fastener (E) in the middle on the opposite side of the end.

Californian Citrus Box.

(24 inches long by 11½ inches wide by 11½ inches deep with partition.)

Ends and partition—Minimum thickness, ¾ inch.

Sides and bottoms—Minimum thickness, 5-16 inch.

Top—¼ inch thick with cleats attached as on the Standard box.

Cleats—11½ inches long by ¾ inch wide by 3-16 inch, minimum thickness.

Use 1½-inch nails for making and nailing.

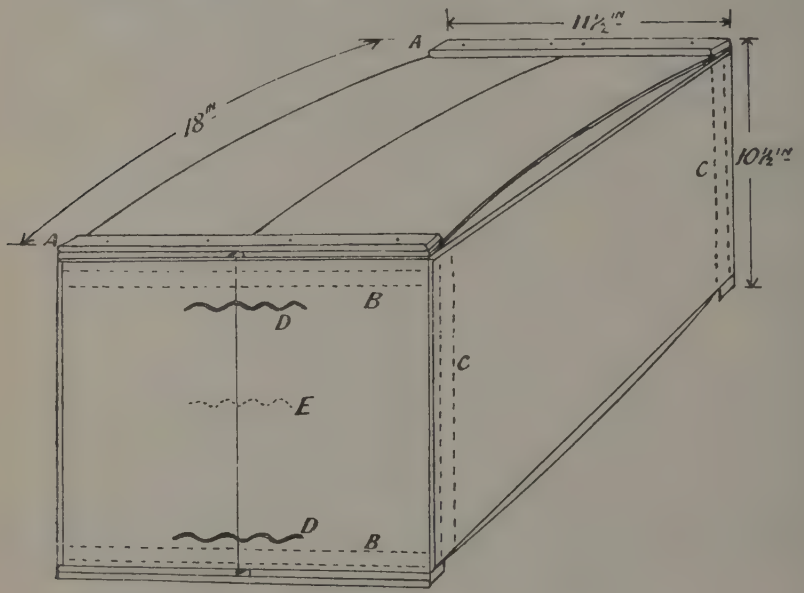


PLATE 159.
Sketch of Canadian Standard Case.

Grading.

As previously mentioned, three grades are recommended:—

"Special," consisting of sound, mature, unblemished fruit of even colour;

"Standard," consisting of sound, matured fruit not unduly marked by insects, fungus, or other injury, and matured fruit unblemished but of poor colour;

"Factory," consisting of blemished fruit free from disease or insect pests.

The operation of grading should be carried out during the whole period of handling the fruit. Whilst picking and when placing from the picking container into the orchard cases, the harvester should separate the "Special" from the "Standard" and "Factory" grades. By doing this "Special" and "Standard" are contained in separate boxes ready for the colouring process. After colouring and whilst transferring the coloured "Special" grade fruit on to the sizing machine a further sorting should be made, any poorly-coloured fruit or

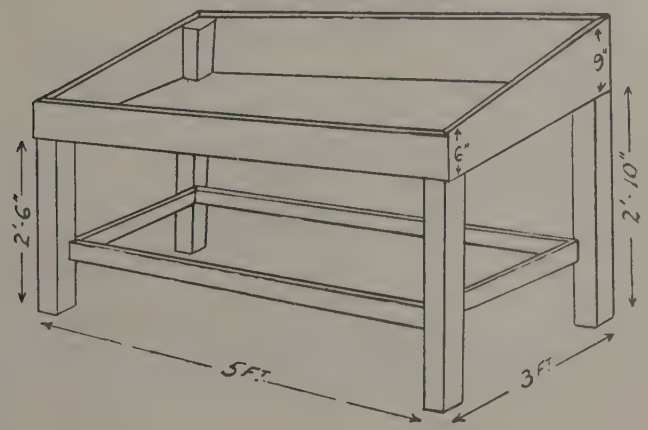
blemished specimens that may have been missed during the first sorting being removed and placed with the "Standard" grade. The same process can be used at this stage to separate "Standard" and "Factory" fruit.

Wrapping.

It is recommended that first grade oranges be wrapped. Wrapping is of great assistance in the safe carriage of oranges over long distances, thereby appealing to the country-order buyer. The wrapping of oranges isolates each individual fruit from the possibility of mould infection from its neighbour, so that in the event of one fruit becoming affected the wrapping paper is a means of preventing infection to the fruit next to it. When wrapping oranges the fruit should be placed in the wrapping-paper and the ends of the paper folded under and on to the cheek of the fruit, forming a pad on which the fruit is placed, and giving a very finished and neat appearance to the wrapped and packed layer.

Sizing.

Sizing the fruit before packing assists greatly in making packs easy to do and easy to bring to the correct height in the case, although there are packers who find no difficulty in packing unsized fruit by using a roomy bench (*see* Plate 160) to hold the fruit, tipping one case only



Fruit Bench to assist in Grading.

PLATE 160.

Fruit Bench to Hold Fruit whilst Packing.

Where there is no mechanical sizer this type of bench is very useful. Greatest efficiency is obtained when only one case at a time is tipped for packing. Please note that the bench is higher at the back than at the front, allowing the fruit to always be close at the packer's hand.

on the bench at a time. The packer then packs two different sizes at the same time, and, while packing, sorts the remaining sizes into separate heaps on the bench. Growers who are fortunate enough to have a mechanical sizer will find the operation of packing made easy provided that care is taken to avoid the pitfalls associated with mechanical sizers. Firstly, it should be remembered that in practically all mechanical sizing

machines two different counts of fruit can be packed from each bin, packing being made very easy if this rule is followed. To enable this to be done it is well to have packing stands of the type illustrated (*see* Plate 161). A spring board of the type illustrated is also helpful in preventing packers from getting aching backs, tired feet, &c.

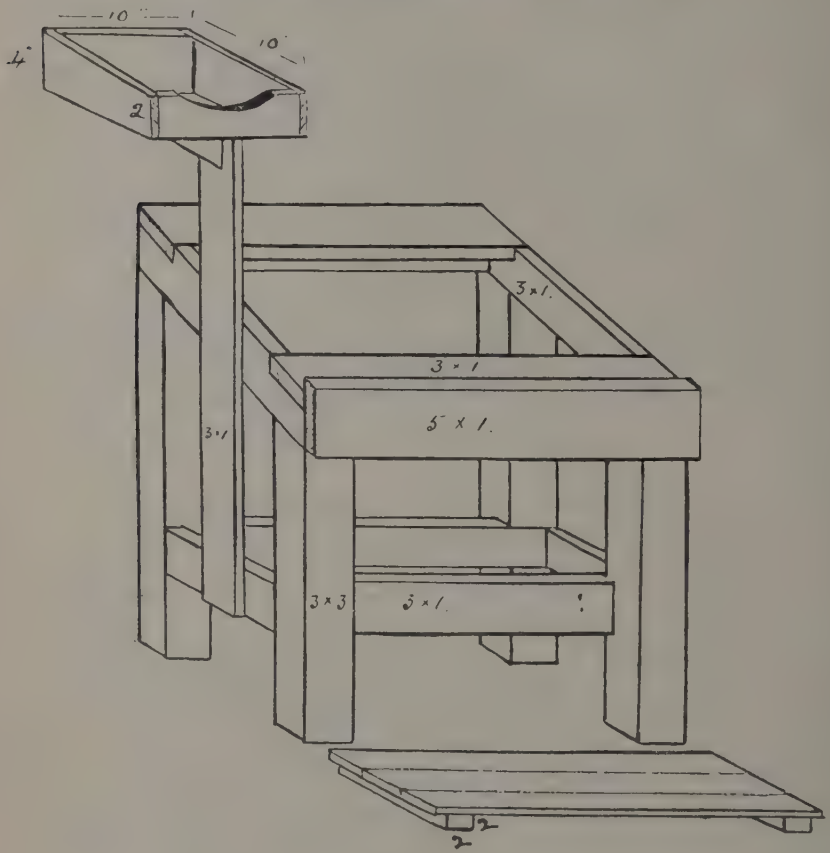


PLATE 161.

Packing Stand with Paper Holder and Spring Board.

This stand is tilted and holds two cases. The tilt assists the packer by keeping the oranges in position. The packer by packing two cases of different sizes at the same time is assisting himself in his sizing.

Fruit is always sized according to the measurement of its diameter, the following sizes being used:—2 inches, 2¼ inches, 2½ inches, 2¾ inches, and 3 inches. Under the Fruit Act oranges are not allowed to be marketed in Queensland when under 2¼ inches in size. The size can be determined by having a set of rings made with these diameters, the orange being placed on the ring with the stalk up. Any orange that will fall through a 2¼-inch ring is classified as a 2-inch orange. Likewise, an orange that will go through a 2½-inch ring and not through a 2¼-inch is classified as a 2¼-inch orange. This method is repeated to determine all sizes. A handy gauge can be cut from a piece of three-ply with a

washer-cutter or carpenter's expansion bit. A few weeks' experience will enable the packer to become so proficient that the use of the rings will become unnecessary. Packers are advised to always pack to a count instead of making up their minds that they will pack to an exact size. When using a mechanical sizing machine best results are obtained by keeping the rollers at a market setting so that the same counts can be packed out of each bin for any particular variety or shape of fruit. After any alteration of the rollers or belts to pack other fruits, the machine can be set back to its original place and the same counts packed from the same bins.

Packing.

The standard diagonal cheek system of packing is best. This pack has the following advantages:—

A given size of fruit will always come to the correct height in the case.

The packed fruit will always look attractive, appearing in straight lines, diagonally, across, and up and down the case, whether opened on the top, bottom, or sides.

No two oranges will rest upon the other, but in the pockets formed between the fruit of the layer beneath.

The height of the fruit in the case can be governed by making the pockets larger or smaller.

The quantity or number of fruit in the case is always the same for each pack, and can be ascertained at a glance.

It is my intention to, as far as is possible, simplify the packing. With this end in view readers will find that the various packs that can be used have been divided into two groups. One group contains a list of packs that will be found by most packers to be all that are necessary to pack all sizes of most types of fruit. The second group consists of intermediate packs which packers might find of use when different types of fruit, such as the Jaffa, occasionally do not come to the correct height in the case when using the packs of the first group. Growers should bear in mind that counts regularly used by the established packing houses are better understood by buyers, and should use these in preference to intermediate counts.

A fault often noticed in private packing sheds is the lack of any attempt on the part of packers to provide themselves with equipment to enable them to work fast and in comfort. Proper equipment in packing sheds soon pays for itself in increased efficiency, enabling a larger output per day to be handled. A pamphlet, "Packing Houses and their Equipment," describing how to make shed equipment, for a small cost, at home during the quiet periods of the year, can be obtained free on application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

By using the packing stand illustrated (*see* Plate 161), the cases are slightly tilted, which helps to keep the fruit in position, thus making the packing much easier. The packer stands with the two cases to be packed into in front of him, with the fruit on one side of the cases and the wrapping paper on the other. The bench with the fruit on should be made tilted to permit the fruit to run to within easy reach of the packer.

The two cases used for citrus packing can be packed correctly by using four different packs. For the Standard box, 18 inches long by 11½ inches wide by 10½ inches deep, the 3—3, 3—2, and 2—2 packs will pack correctly all commercial sizes of fruit. When packing the Dump case the 3—2, 2—2, and 2—1 packs are used. A reference to the packing chart used in conjunction with a description of packs, will assist the beginner in understanding the difference between the different packs.

3—3 Pack.

This pack is only used in the Standard box and is very easy to do if care is taken in placing the first six oranges in the first layer. Three of these are placed in a layer across the end of the case with the stalks facing the end of the case nearest the packers, the first fruit being placed in the left-hand corner and the other two being spaced equal distances apart between the corner fruit and the right-hand side of the box. This leaves three even spaces between the fruit in which we place the next three oranges, forming the 3—3 from which the pack gets its name. This is repeated until the layer is finished. Care must be taken to see that fruit is placed in straight lines. The layer is then completed by placing lines of three in the spaces between each line of fruit until

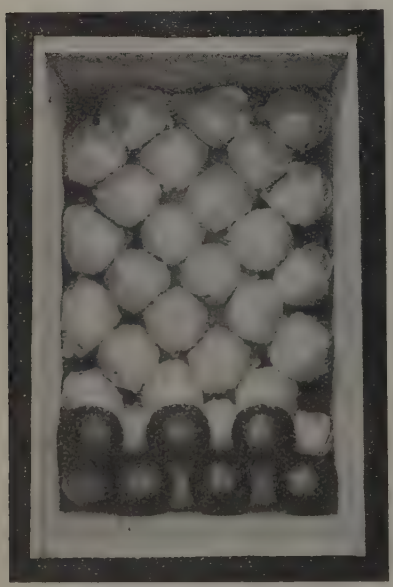


PLATE 162.

SECOND LAYER.
3-3 Pack.

The second layer is started by placing three oranges on the pockets between the first three fruit of the first layer. The layer is completed by placing fruit on the remaining pockets of the first layer.

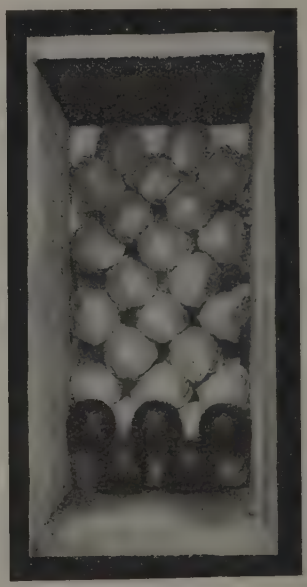


PLATE 163.

SECOND LAYER.
3-2 Pack.

The second layer is started by placing two oranges on the pockets between the first three fruit of the first layer. The layer is completed by placing fruit on the remaining pockets of the first layer.

the last line at the end of the layer is reached. The last three oranges are then placed in position but reversed so that the stalk end is facing the end of the box. The second layer is packed in the same manner as the first, but is placed in the pockets or spaces of the first layer (Plate 162). The same rule of placing the stalk end of the fruit to the wood applies in all of the packs.

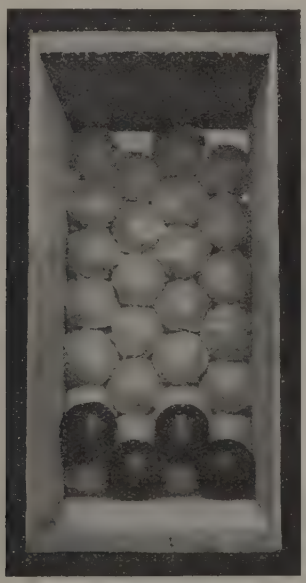


Plate 164.

Second Layer.
2-2 Pack.

The second layer is started by placing two oranges on the pockets between the first two fruit of the first layer. The layer is completed by placing fruit on the remaining pockets of the first layer.

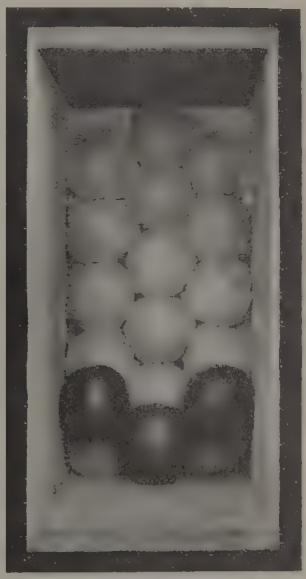


Plate 165.

Second Layer.
2-1 Pack.

The second layer is started by placing one orange on the pocket between the first two oranges of the first layer, finishing the layer by placing oranges on the remaining pockets.

3—2 Pack.

In the 3—2 pack the first layer is started by placing an orange in each corner of the case and one exactly midway between them facing end to end in the case, the stalks facing the packer. This forms a line of three oranges with two spaces, or pockets, between them. The pack is continued by placing two oranges in these spaces, which leaves three pockets between the two oranges. We repeat the placing of three oranges in these pockets, and then alternately two and three until the layer is finished, except for the last line of fruit; this is reversed with the stalks facing the wood of the case end furthest from the packer. To start the second layer (*see* Plate 163) place two oranges in the pockets formed by the first three oranges of the first layer, then two and three alternately, the stalks facing as in the first layer until all the pockets of the first layer are filled, again reversing the last line of fruit across the case. This process is repeated layer by layer until the case is filled.

2—2 Pack.

This pack is started by placing an orange in the bottom left-hand corner of the case and midway between this orange and the right side of the box a second orange, leaving two pockets between the two in which the next two oranges are placed, thus forming the 2—2 from which the pack derives its name. This is then repeated, the oranges being placed facing as in the 3—2 pack until the layer is finished with all but the last line of fruit. This is reversed with the stalks facing the wood of the case end furthest from the packer. The second layer is started by placing two oranges in the pockets formed by the first two of the first layer (*see* Plate 164), the layer being finally finished by placing oranges in all the pockets of the first layer and reversing the last line of fruit as in the first layer. By repeating this process layer by layer the case is finished. If close attention to the rule of starting the first layer in the left-hand corner is observed the number of layers in the case can be easily counted, the first, third, fifth, and seventh layers starting in the left-hand corner, and the second, fourth, and sixth layers starting in the right-hand corner. Knowing the number of layers there are in the case is of great assistance in separating counts such as the 96 and 112 in the Dump case, in which the layers look the same although the 112 contains one more layer than the 96.

2—1 Pack.

This pack is used only for the Australian Dump case. The same rule of placing the stalk end of the fruit to the wood applies. The pack is started by placing an orange in each corner of the case, which leaves a space between the fruit. A third orange is placed in this space or pocket, which gives us two and one from which the pack derives its name. The same process as with the other packs is then used to complete the layer. The second layer starts with one orange placed upon the pocket between the first two of the first layer (*see* Plate 165), followed by two, one, two, until the layer is finished. The case is completed by repeating further layers in the manner of the first and second layers, packing until full.

A close examination of the packing tables given will be of assistance. These will be dealt with separately for both cases. To simplify the packing as much as possible the packs will be divided into two sections for each case, one table giving the regular packs to use, the second giving the intermediate packs which can be used when the regular packs do not pack a given type of fruit satisfactorily.

Packing the Australian Dump Case.

The dimensions of the Australian Dump case are—18 inches long by $8\frac{3}{8}$ inches wide by $14\frac{1}{4}$ inches deep. The timber for this box should be cut with the sides of a minimum thickness of five-sixteenths of an inch, with the tops and bottoms a quarter of an inch thick. Unlike the Standard box, no cleats are used. The finished case should have a bulge of $\frac{1}{2}$ inch to 1 inch on the top and bottom of the case when packed. Three packs are used to pack this box, the 2—1, 2—2, and 3—2.

TABLE A.

A Simplified List of Packing Counts to be Used for the Australian Dump Case.

Approximate Size.	Pack.	Layer Count.	No. of Layers.	Total.
2¼ inches	3—2	6—6	8	240
	3—2	6—5	8	220
	3—2	5—5	8	200
	2—2	7—7	7	196
2½ inches	2—2	7—6	7	182
	2—2	6—6	7	168
2¾ inches	2—2	6—5	7	154
	2—2	5—5	7	140
	2—2	5—4	7	126
3 inches	2—2	4—4	7	112
3¼ inches	2—2	4—4	6	96
	2—2	4—3	6	84
	2—1	5—5	5	75
3½ inches	2—1	5—4	5	68
	2—1	4—4	5	60
	2—1	4—3	5	53
4 inches	2—1	3—3	5	45

Try on all occasions to pack your fruit with these packs in preference to those in Table "D."

TABLE B.

Intermediate Packs to be Used for the Australian Dump Case.

It is recommended not to use these packs unless it is found that a type of fruit will not come to the correct height when any of the counts in Table "A" are used. On occasions when case ends are cut too wide it will possibly be found that one of these counts will assist to overcome the difficulty.

Approximate Size.	Pack.	Layer Count.	No. of Layers.	Total.
2¼ inches	2—2	8—7	7	210
2½ inches	3—2	6—5	7	193
	3—2	5—4	8	180
	3—2	5—5	7	175
	2—2	7—7	6	168
2¾ inches	3—2	5—4	7	158
	2—2	7—6	6	156
	2—2	6—6	6	144
	3—2	4—4	7	140
3 inches	3—2	4—4	6	120
	3—2	4—3	6	105
	2—1	5—5	6	90
3¼ inches	2—1	5—4	6	81
	2—1	4—4	6	72
	2—1	4—3	6	63

Knowing the number of layers in a case at any stage of the packing is a good guide to a packer. By calculating the height the fruit will come to in the case two or three layers before the top is reached, the packer, by applying the rule, "The size of the pockets governs the

height of the fruit in the case," can bring the fruit either higher or lower as necessary. This is done by making the pockets smaller by slightly increasing the size of the fruit, and bringing the fruit higher in the box to correct a pack which will come too low, or, in the case of a pack that is coming high, to open the pockets by reducing slightly the size of the fruit. Usually these faults are caused by a variation in sizing the fruit in the subsequent layers after placing the first layer into position. Cases not of the correct width are often the cause of trouble in bringing to the correct height, but by following the rule governing the size of the pockets this difficulty may be overcome. It should be remembered that it is an offence against the Fruit and Vegetables Act to market fruit in under-sized cases.

Oranges packed in the Dump case should be packed 1 inch to 1½ inch above the top of the case, and when nailed have a bulge of ½ inch to 1 inch top and bottom.

[TO BE CONTINUED.]

NO OPEN SEASON FOR OPOSSUMS.

The Minister for Agriculture and Stock (Mr. F. W. Bulcock, M.L.A.) has announced the decision of the Government to continue the measures in force for the protection of the opossum in this State throughout the present year. This decision was arrived at after full consideration had been given to the various factors incidental to the opening of an opossum season.

For months past, said the Minister, his Department had been closely following developments in the oversea markets, which constituted a primary factor in any decision on the matter. In addition, reports were sought from departmental officials and other reliable sources of information as to whether the number of opossums in the breeding districts of the State was sufficient to justify trapping operations. The latest information available definitely indicates that opossums are not in sufficient numbers in the favoured districts to permit of legitimate trappers securing fair average supplies.

Information obtained as a result of inquiries on oversea marketing conditions shows that a total of approximately 1,520,000 opossum skins were catalogued and sold at the February and April sales held in London this year, and all Australasian supplies were practically cleared. Prices at the February sale showed a hardening tendency on the previous abnormally low averages of the past two or three years, but the figures for the April sale could not be classed as satisfactory, in that, although certain lines were sold at previous prices, a large proportion of the offering showed a distinct decline on figures for the February sale.

Taking the two primary factors into consideration, it is evident that an open season during the present year would not yield the trapper a reasonable return for his outlay and work. The Minister pointed out that although the Government was prepared to exploit every legitimate avenue for employment, it would be recognised that trappers should be afforded protection against operating under conditions which would be distinctly to their financial disadvantage at present.

In referring to the necessity for conserving the opossums in seasons when they are scarce in numbers, Mr. Bulcock emphasised the importance of the industry to the State when he pointed out that the value of the opossum skins obtained during the last four open seasons, aggregating only six months in the period since 1926, reached a total sum of almost £1,500,000.

Passion Fruit Culture in Queensland.

By H. BARNES, Director of Fruit Culture.

THE principal passion fruit grown commercially in Queensland is the common purple variety, *Passiflora edulis*. Other varieties have been tried from time to time, but have not proved sufficiently successful to warrant their general cultivation.

The passion vine is a climber and thrives best in the warm moist atmosphere of the tropics and sub-tropics. It requires constant attention by way of cultivation, pruning, and spraying for best results. It is a fact that the vines grow vigorously in our scrubs without care or attention and yield crops without trace of disease. When, however, the vines are domesticated, growing conditions are entirely altered. In the natural state the vines are isolated from any source of disease infection, and, further, their growth does not become as congested as it does when grown on a trellis. The production of dense masses of foliage is favourable to the development of diseases to which vines are so subject.

The usual features required to be taken into consideration when selecting a site for an orchard are also necessary when determining an ideal situation for growing passion fruit. Two of the main factors to consider are aspect and soil.

With regard to the aspect, a gentle slope to the east or north-east, sufficiently elevated to be above frost level and well sheltered from heavy winds, is best.

Good scrub or forest loams possessing good natural drainage will produce good crops. Comparatively poor soils will also grow good passion fruit if they are well drained and are systematically manured and kept well cultivated. Vines will not thrive in sour soil conditions. Stagnant water at the roots is fatal to them; for this reason it is not advisable to select very heavy soils.

Cropping Habit.

The passion vine bears its fruit on new growth. The time of first fruiting varies considerably, depending chiefly on the season of planting. As a general rule, however, when the vines are planted in the early spring, the first crop will be harvested in from twelve to fifteen months. When autumn planting is adopted the first profitable crop is generally borne the following summer twelve months, that is, eighteen to twenty-one months after planting.

As a rule two crops are borne yearly—a main summer crop and a secondary winter crop—though intermediate crops are at times obtained. Two to three months elapse from the time of the setting of the fruit to maturity. Under average conditions the vines flower during August, September, and October for the summer crop, which is harvested during November, December, and January. An intermediate flowering may occur about November or December, giving an autumn crop; whilst for the winter crop the vines flower during February and March and the crop is harvested during May, June, and July.

During particularly favourable growing years the vines may be in almost continuous growth, and consequently will ripen fruit practically all the year round; such, however, is not the general rule.

The profitable life of the vine is about four years when grown under proper cultural conditions. Maximum cropping is obtained with the second summer crop, following which the tendency is for the vines and the quality and appearance of the fruit to gradually deteriorate. Reasonably good crops can, however, still be obtained for another year or two.

Preparation of the Land.

Two much stress cannot be laid on the importance of thoroughly preparing the land prior to planting. The soil should be ploughed deeply and reduced to as nearly a perfect tilth as possible in order to provide the best soil conditions in which to grow the young plants. No amount of subsequent cultivation can make up any deficiency in preliminary preparation. Deep working makes a greater body of soil available from which the roots will be able to absorb plant foods, and also ensures better drainage.

Propagation.

Plants are easily raised from seeds or cuttings, though the former method is almost generally adopted and is recommended.

In connection with the selection of seed, it should be remembered that passion fruit are subject to several serious diseases (information concerning which can be obtained from the Chief Entomologist of the Department of Agriculture and Stock), and it is possible that these diseases can be transmitted per medium of the seed. Intending planters are therefore advised to obtain only perfectly formed fruits which have been allowed to mature fully on vigorous healthy vines. If the pulp is removed from the fruit and placed in a vessel of water for several days to ferment, the seeds may be easily separated from the mass. They should then be well washed in clean water and dried in the shade.

If early spring ripened fruits are selected and the seeds planted immediately, seedlings will be ready to plant out during the summer or autumn. If plants are required for spring planting (which period is preferable) seeds can be selected from fruit maturing in the late summer or autumn; if planted then seedlings will be available for planting the following spring.

The seeds should be sown in a specially prepared seed bed composed of light soil and leaf mould. They should be set half to three-quarters of an inch below the surface, and the soil should then be firmly pressed and subsequently mulched lightly with well-rotted manure. The bed should be sheltered from the sun and kept judiciously watered. In three to four weeks the young seedlings will appear, and as they develop they should be thinned out to about four inches apart, whilst the shade can be gradually removed.

Transplanting.

When the plants are about twelve inches high they may be planted out in the vineyard. Removal of the plants from the seed bed will be facilitated if the bed is given a thorough soaking before digging the plants; this will enable them to be lifted without excessive injury to the roots. Care should be exercised at all times when transplanting not

PLATE 166.— PASSION FRUIT VINE.
Showing fruiting habit.

to expose the roots to the sun and dry air which will quickly dry them out; keep them covered with damp sacking until they are ready to plant. If the tops of the plants have made excessive growth it is advisable to cut them back to about twelve to fifteen inches high in order to reduce evaporation of sap and avoid any tendency to wilt. Holes where the plants are to be set under the trellis should be dug in readiness. The soil round the roots should be well firmed and a quantity of water applied to each plant before the holes are completely filled in. If the weather is at all dry the plants may need to be given one or two further waterings at weekly intervals, following which ordinary cultural methods should fulfill all requirements.

Trellising and Planting.

Prior to planting the land should be marked off in rows about ten feet apart. The rows should run as nearly as possible north and south so that the plants may benefit from the sun's rays on both sides. If the vineyard is on a steep hillside, however, the contour of the land may play a considerable part in determining the direction of the rows. If the site selected is subject to washing during heavy rains the rows may be planted across the slope and provision made for contour drains to prevent as far as possible loss of surface soil by erosion.

Trellises consisting of good fencing posts should be erected along the rows, the posts being set 15 feet apart with their width across the row. Good sized posts are 8 inches wide by 3 inches thick by 7 feet 6 inches long; they should be set 18 inches in the ground, leaving 6 feet above the surface. The end posts should be much heavier, and should be well strutted and set 2 feet 6 inches deep, as they have to act as strainers and prevent the wires from sagging when they have to carry a heavy growth of vine. If the rows are very long it is advisable to have intermediate strainers about every 80 yards, or spreaders may be used to support the weight.

Two systems of wiring are in use, the first known as the parallel system in which two No. 8 galvanised wires are firmly fixed to the tops of the posts, one on each side, so that they form horizontal parallel lines about 8 inches apart, and the second known as the vertical system in which one wire is fixed to the top of the posts and the other placed about 15 to 18 inches below it. Each system has its advantages and disadvantages, but it is considered that the "parallel" system is the best for general adoption in this State.

If any grower favours the vertical system, four main leaders may be left, the first two being trained one each way on the lower wire and the remaining two on the top wire. One disadvantage of this system, however, is that, where growth is very vigorous, the laterals from the leaders on the top wire tend to smother the growth on the bottom wire and exclude the necessary light and air, thereby promoting the development of diseases. The system is probably better suited to vines grown on poorer land where the growth is not so vigorous and the foliage less dense.

The seedlings should be planted midway between the posts—*i.e.*, 15 feet apart. In two or three weeks following transplanting the vines will be in vigorous growth and will develop a number of laterals and shoots from around the crown of the plants at ground level. All should at first be allowed to grow until they are 18 to 24 inches long. The

Plate 167.—Passion Fruit Vine.
Showing how the plants drag on the ground when grown on low trellis.

most vigorous growth should then be selected to form the future stem of the vine, and all the remaining shoots including the original stem should be cut away. The single stem selected should be tied to a light stake fixed firmly in the ground, and tied at intervals until it reaches the height of the trellis. The terminal bud should then be pinched out and two main leaders induced to develop. These are trained one each way along the wires until they reach the posts midway between the adjoining vines, when their further growth should be stopped by again pinching out the terminal buds. All branches developing from the main stem between the ground and the height of the trellis should be suppressed. Lateral branches will develop from the main leaders all along the wires, and these should be allowed to develop at intervals of about 9 inches. The laterals should be trained alternately over the two parallel wires and allowed to hang down. In this way the weight of the vine is distributed over the two wires. It is claimed at times that the vines give better results if trained only in one direction on the wires, but except in instances of rows planted up and down the slopes of hills (in which case it is found that the vines grow more vigorously up hill than down), the practice does not appear to have any advantage over the two-way system.

Pruning the Passion Vine.

Although there is no record that the pruning of the vine will increase its annual cropping capacity, it is nevertheless advisable to perform a certain amount of cutting back with the object of—firstly, keeping the vines healthy; secondly, inducing a growth of vigorous healthy wood on which good fruit will be borne; and thirdly, to bring in the crops at different periods of the year when better prices are realisable. The susceptibility of vines to certain diseases renders it necessary for them to be kept open to permit free penetration of light and air, and in order that they may be more effectively covered with preventative sprays.

It is never advisable to prune passion vines very severely. Vines so treated, if they survive, at times have a tendency to become shy-bearing. It is also important to remember that only very light thinning-out should be resorted to during dry weather.

It is a difficult matter to lay down in detail a set method of pruning, as each vine is likely to present a new problem which must be solved on the spot. Generally, however, all dead and diseased wood should be removed, long straggling laterals should be cut back to keep them clear of the ground, and where the growth has become dense and tangled the secondary laterals may be cut back to nine to twelve inches from the primary laterals which develop from the main leaders on the wires. All weak and spindly growths should be entirely removed, as such cannot produce good fruit. Pruning is a tedious work, but nevertheless it should be carefully done and every cut made with a definite purpose.

Most fruit trees are pruned during the winter time when growth is dormant, but as this is usually a dry period and, as has been mentioned previously, only light thinning is advisable at such times, the main pruning of passion vines is best carried out about the end of January and February after the main summer crop has been harvested. Rains are usual at this time of the year, which will assist the vines to put forward new growth for the second or winter crop, and the risk

of injury to the vines is not so great. Light pruning only should be done during a dry winter, the months of July and August generally being considered the best time.

The bulk of the main or summer crop of fruit is harvested during December and January, with the result that market prices at this time fall very low. Those growers who are particularly favoured by having the vineyard situated in a warm locality may take advantage of the fact that, provided the soil is well supplied with moisture, vines may be forced into growth at any time by pruning. If the vines are pruned earlier than usual for the summer crop they are likely to mature early fruit which will reap the benefit of the better prices obtaining before the main crop is harvested.

If the grower wishes to produce an extra big crop during the autumn or winter months, the summer crop must be sacrificed by pruning back the flowering secondary laterals to within nine to twelve inches. If a big summer crop is desired the winter crop must similarly be sacrificed.

Fertilizing.

The passion vine is a heavy feeder, and, whilst fertile virgin land may not need fertilizing for the first year or so, poorer soils should be fertilized from the outset. The Agricultural Chemist in his booklet "Complete Fertilizers for Farm and Orchard" recommends the following manure for passion fruit:—

"Use per acre, in accordance with the quality of the soil a mixture of—

1 to 2 cwt. nitrate of soda;

4 to 8 cwt. blood and bone manure;

1 to 2 cwt. superphosphate; and

1 to 2 cwt. sulphate of potash.

A top-dressing with 1 cwt. of nitrate of lime or nitrate of soda in spring will be found beneficial."

OTHER VARIETIES.

Passiflora laurifolia—"Bell Apple."

The Bell Apple is not grown to any extent in this State, though its fruit is quite edible. It is regarded more as a vigorous and handsome creeper than as a producer of fruit for market, and its cultivation for the latter purpose is not recommended. Without hand fertilizing it is prone to be shy-bearing.

Passiflora ligularis—"Mexican Passion Fruit."

This variety is of no use for commercial purposes as the pulp is absolutely without flavour.

Tacsonia mollisima—"Banana Passion Fruit."

The Banana Passion Fruit has been tried in this State, but the demand for the fruit is very poor, and it is consequently not worth growing. The matured fruit is elongated in shape, yellow in colour,

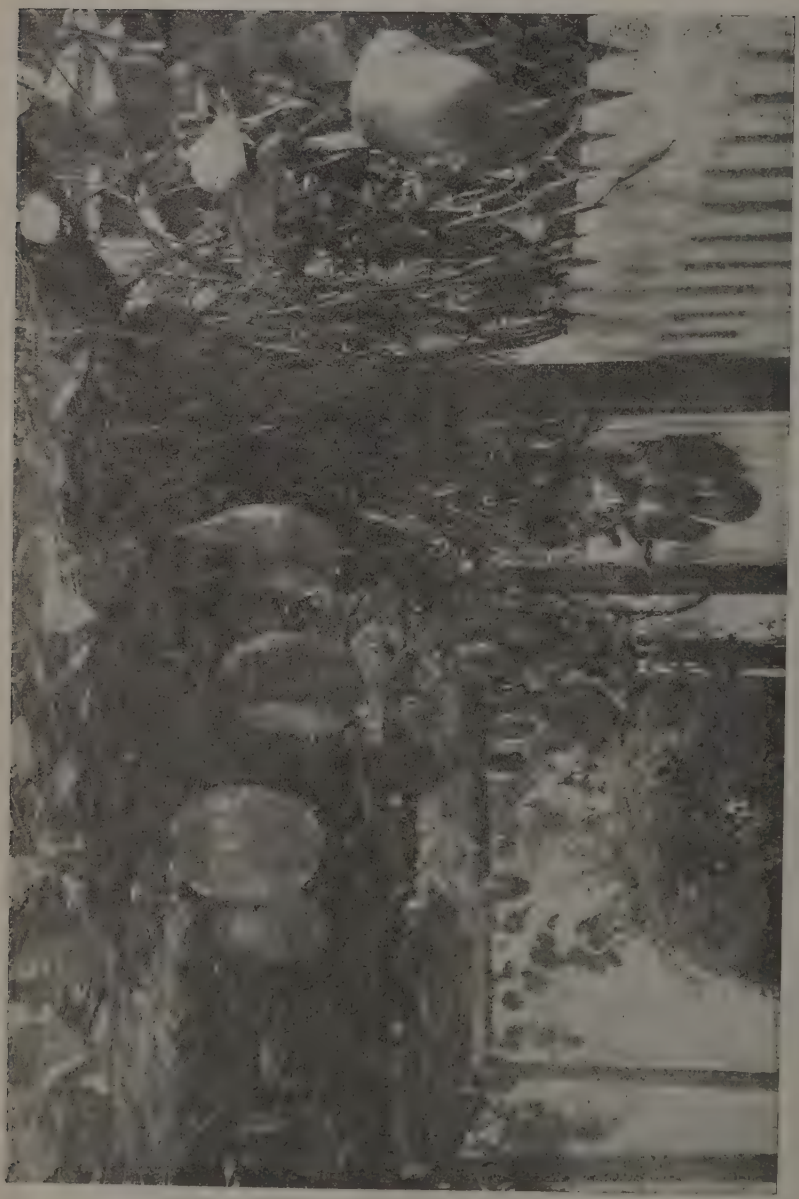


PLATE 168.—GRANADILLA PASSION VINE, TARINGA, NEAR BRISBANE.

and possesses a delicate skin. The flower is a pretty shade of pink and makes a splendid show when the vine is grown for ornamental purposes.

Passiflora macrocarpa—"Granadilla."

This variety of Granadilla can be grown practically anywhere on the coast of Queensland in warm situations. The fruit, as the name signifies, is very large, frequently weighing several pounds. The seed cavity is small for the size of the fruit, and is surrounded by a thick layer of whitish flesh of no particular flavour, but which, when flavoured with lemon, &c., may be used for pies. The plant is best grown on a lateral trellis.

Passiflora quadrangularis—"Granadilla."

This variety, which thrives in the tropical conditions of the North, is a smaller fruit than *P. macrocarpa* of a somewhat irregular oblong shape, about 4 to 4½ inches in diameter and 6 to 9 inches long. When fully ripe this is one of the most highly flavoured of all tropical fruits, and is much relished by those who know it. The cavity is large, and is filled with large seeds surrounded by a pale yellow pulp. Maturity is indicated by the softening of the flesh and the changing of the pale green colour to a dull yellowish green. Cultivation is similar to that of *Passiflora edulis*, and for preference the vine should be trained on an overhead trellis.

The Granadilla, when grown in Southern Queensland, often proves to be shy-bearing. The flowers are protandrous—i.e. the pollen of the anthers is ripe before the stigmas are ready to receive it. The pollen of younger blossoms is therefore necessary to fertilize the older flowers. Insects flying from one flower to another may carry the pollen with them and effect the required fertilization, but in the absence of insects hand pollination must be resorted to. A small camel-hair brush provides a ready medium for the transference of the pollen.

THE PREMIER'S MISSION TO GREAT BRITIAN.

THE Premier, Hon. W. Forgan Smith, remarked in the course of a message from London on the progress of his mission on behalf of Queensland producers that he had seen the British Minister of Agriculture (Right Hon. Walter Elliot), who advised him that the British Government had no intention of endeavouring to impose any quota on Australian dairy produce. Mr. Forgan Smith also has an assurance from the Imperial Authorities that no attempt to interfere with the preference on sugar would be made during the currency of the existing agreement, which still has about two years to run. He hoped to have further conversations on the subject before his departure from England on 7th July. The Premier went on to say that the British feeling towards Australia was marked and friendly, and the public generally held Australians in high regard. Queensland was favourably known, and he had been received kindly on every side.

Australian Nut.

By E. H. GURNEY, Agricultural Chemist.

DURING the past two or three years increased interest has been taken in the planting and cultivation in Queensland of the Australian Nut (*Macadamia ternifolia*). This nut was previously known under the name of Queensland Nut.

Therefore, it was thought that the publication of analyses, conducted in the Agricultural Laboratory of the Department of Agriculture and Stock, of a few samples of this nut, would be of interest and value for purpose of comparing any alteration that may occur in composition of the nut, due to introduction of any particular new strain or new cultural procedure.

The three analyses in the following table were made upon samples received in 1926, and were grown by Mr. J. F. Waldron, Upper Eungella, Tweed River, New South Wales. These analyses appear in the 1925-1926 annual report of the late J. C. Brünnich, Agricultural Chemist. It will be noted that No. 1 sample was not fully ripe and the kernel is shown to contain a very high moisture content. The green hulls of this sample were found to contain 4½ per cent. of tannin. The above-mentioned report contains the following statement:—

> "It will be noticed that, although the kernel of the thin-shelled variety is somewhat smaller than that of the ordinary variety, the percentage weight of the kernel is very much larger, so that 1 lb. of the thin-shelled nuts yields 6½ oz. of kernel, as against 4¼ oz. of kernel in 1 lb. of the ordinary variety."

	No. 1. Thin-shelled Nuts with Hull rather Green.	No. 2. Thin-shelled, Hull Ripe.	Ordinary Variety with Hull Ripe.
Average weight of hull (grms.)	8·7	..	9·75
Average weight of nut (grms.)	8·2	7·8	14·8
Average weight of shell (grms.)	4·8	4·7	10·8
Per cent. shell	58·7	59·9	73·2
Average weight of kernel (grms.) ..	3·4	3·1	4·0
Per cent. kernel	41·3	40·1	26·8
Analysis of kernel—			
Moisture per cent.	28·2	6·1	11·8
Protein per cent.	8·9	8·7	8·6
Oil per cent.	52·8	72·7	70·0
Carbohydrates and fibre, per cent. ..	8·2	10·5	7·1
Ash, per cent.	1·9	2·0	2·5

The following table contains analyses of samples of the Australian Nut grown in Queensland in 1933. Sample No. 5030 was forwarded by Mr. J. Oxenford, Oxenford, and the other three samples, Nos. 949, 950, and 951, were grown by Mr. W. R. Petrie, Petrie. Each of these

samples of Mr. Petrie were picked from one tree only and all trees were grown on forest land without fertilizers.

	Variety, Laboratory No., and where Grown.						
	5030 Oxenford.	949 Petrie "Pearl."		950 Petrie "Planet."		951 Petrie "Red Windsor."	
Kernel	26·2%	42%		31%		32%	
Shell	73·8%	58%		69%		68%	
Average weight of kernel (grms.) ..	2·2	3·15		2·43		2·35	
Average weight of nut (grms.) ..	8·4	7·50		7·84		7·34	
	Kernel.	Kernel.	Shell.	Kernel.	Shell.	Kernel.	Shell.
	%	%	%	%	%	%	%
Moisture	5·1	3·01	10·39	2·92	10·73	3·01	10·98
Protein (N × 6·25)	7·4	7·13	1·66	8·885	1·75	10·11	1·66
Total Sugars ..	4·0	6·51	} 21·04	3·68	} 23·75	6·02	} 23·03
Other Carbohydrates by diff. ..	8·3	5·83		5·32		5·39	
Starch	Nil	Nil	..	Nil	..	Nil	..
Oil (Petrol Ether Extract) ..	71·4	73·68	0·28	75·44	0·32	73·04	0·32
Fibre	2·3	1·96	65·75	2·04	61·15	1·00	63·15
Ash	1·5	1·88	0·88	1·75	2·30	1·43	0·86
Containing—							
Lime (CaO) ..	0·11	0·44	0·12	0·16	0·15	0·19	0·13
Magnesia (MgO)	0·22	0·19	0·02	0·18	0·06	0·19	0·06
Potash (K_2O) ..	0·49	0·80	0·12	0·65	0·18	0·25	0·17
Phosphoric Acid (P_2O_5) ..	0·48	0·43	0·06	0·49	0·07	0·43	0·04
Refractive Index of Oil at 40°C. ..	..	1·4605		1·4605		1·4597	

The oil in each sample was clear, light in colour, and of pleasant odour.

The analysis of the hulls of sample 5030 is given below expressed as percentage of the hull.

	Per cent.
Moisture	17·7
Nitrogen	0·60
Ash	3·7
Lime (CaO)	0·17
Magnesia (MgO)	0·20
Potash (K_2O)	1·85
Phosphoric Acid (P_2O_5)	0·17

When extracting the kernel from the shell upon a commercial scale, there is a certain amount of the kernel left with the shell; therefore, to determine the composition of the screenings and sweepings of the broken shells, Mr. J. C. K. Sibbald, vice-president of the Australian Nut

Association, forwarded samples of such shell sweepings, and shell free from kernel. The analyses of these samples are given below.

	Laboratory No.	
	1808	1809
	Screenings and Sweepings.	Shells.
	Per cent.	Per cent.
Oil	10·29	1·41
Nitrogen	·48	·28
Protein (Nitrogen × 6·25)	2·98	1·75
Ash	2·01	·95
Containing—		
Lime (CaO)	·36	·16
Phosphoric Acid (P_2O_5)	·34	·09
Potash (K_2O)	·14	·17

Land for Grazing Selection.

LANSDOWNE RESUMPTION.

PORTION 3, parish of Westbourne, Blackall Land Agent's District, comprising resumption from Lansdowne Holding, is situated about 80 miles south-easterly from Blackall, and comprises an area of about 21,640 acres. The portion will be opened at the Land Office, Blackall, on Thursday, 12th July, 1934, for Grazing Homestead Selection for a term of lease of twenty-eight years, and at an annual rental of threepence per acre for the first seven years of the term.

The portion consists of open, well-grassed Mitchell and blue grass country, lightly timbered, and is good wool-growing and fattening country. Water supplies are obtained from three tanks and the supply is sufficient. Other improvements comprise fencing.

The selection will require to be stocked to its reasonable carrying capacity with the applicant's own sheep within a period of three years, and proof must be furnished of the financial standing and pastoral or land experience of the applicants. The selection will be subject to a special condition that it be enclosed with a rabbit-proof fence within three years from the issue of the license to occupy.

Free lithographs and full particulars may be obtained from the Land Agent, Blackall, the Land Settlement Inquiry Office, Brisbane, and the Government Intelligence and Tourist Bureaux, Sydney and Melbourne.

Agricultural Notes.

By H. S. HUNTER, Agricultural Branch.

WELL distributed autumn rains have assured a good winter in most of the agricultural areas. Grass is in abundance in the dairying country, especially near the coast, and these pleasant conditions should continue until heavy frosts harden the bite. Fodder crops are making excellent growth, and dairy farmers who found it possible to cultivate an ample acreage should have no need to worry about any shortage at the bucket white the cold weather is on.

Cereal Crops.

Beyond the Range the May rains came at an opportune time for the sowing of wheat and other winter-growing cereal crops. Grain growers now are very active sowing. The rains have induced a good growth of herbage, which will be of considerable value to the dairyman and sheep raiser.

Before last month's rains the early-planted wheat crops on the Downs could not be grazed owing to the risk of uprooting them, but these crops now are being grazed heavily. As a result of this feed being available there has been an increase in the output of dairy produce at most of the Downs factories, in contrast to the Lockyer and other inter-coastal districts, where the grazing of cultivation paddocks is not practised to the same extent.

The Cane Crop.

The sugar-cane crop in the far Northern areas did not show much progress during the past month; soil moisture conditions were favourable, but temperatures were relatively low. In the Burdekin area the crop continued to advance satisfactorily, but a continuance of dry weather has rendered irrigation necessary. The Mackay crop made slight progress under the dry and cool conditions experienced, while the crop in the southern areas improved steadily, due largely to favourable soil moisture. In all areas it is anticipated that arrowing of the crop will be heavy; many fields have already flowered, and such crops will, therefore, put on no further growth.

Crop estimates are now being made, and the projected yields for the 1934 crop will be available at an early date.

General Farming Outlook.

The dry weather of March was not without its compensations. Reports from the several centres on the Darling Downs and the Burnett and Moreton districts indicate that full advantage was taken of the conditions then obtaining to cure large quantities of excellent quality hay from the lucerne and Sudan grass crops.

The result is that many farms have good stocks of this valuable fodder stored for feeding to live stock during the winter, or as a set-off against a possible dry spell in the early spring. In these times fodder conserved on the farm is the more valuable because of the fact that most holdings are stocked to full capacity and, in some instances, above the margin of safety in an endeavour to offset low prices by increased production.

In the South Burnett district record quantities of lucerne hay have been made, and silos, which are reported to have remained empty for years, have been filled again. In addition, oats and barley have been planted extensively for winter feed.

The Central Burnett district is nearing the completion of one of the best and longest dairy seasons in its history, and the local butter factories have broken their previous records of output of dairy products. All stock are in excellent condition for the winter, feed is plentiful, and there is an abundance of stored fodder on the farms.

The remarks relating to Southern Queensland generally may be applied also to the central division. Live stock are in good condition for the winter, and the improved seasonal conditions have encouraged farmers to prepare fairly large areas for planting with wheat and winter fodder crops. Wheat is not grown extensively for grain production in the central division, although in the past crops in the Dululu and Theodore districts have yielded good quality grain when the seasons have favoured the crop.

Draught Horses in Demand.

Throughout the farming districts there is a keen demand for draught horses of good quality. This demand has existed for some considerable time, and as a result Clydesdale studs are being strengthened by the introduction of high-priced sires from the Southern States. Good quality working draughts, fillies, or geldings command up to more than £30 per head at the Toowoomba horse sales.

Business in Butter.

Since the Commonwealth Dairy Produce Act came into operation on 1st May, the wholesale home consumption price of butter in all States has been fixed at 140s. per cwt. This has provided welcome relief to producers in the Southern States, as the price, for the first time in many years, will be on a level with that operating in Queensland. This price during May will apply to only 45 per cent. of the Australian production, as an export quota of 55 per cent. has been fixed under the Act for that month. At the time of writing the wholesale price for Australian butter on the London market is in the vicinity of 70s. per cwt. The Australian Dairy Produce Export Control Board has decided that the existing 20 per cent. restriction on butter exports to the United Kingdom shall be discontinued.

BLOAT IN CATTLE.

A well known dairy farmer writes (28-4-34) :—"One time in my heard of cows there were four cows that had to be taken to the yard about 4 p.m. nearly every day while the clover was good because they were blown. I had some sticks, with ropes attached, that were put in their mouths ready for them. The ropes were to go round the head to keep the sticks in place. As soon as the cows belched wind I knew they were safe. Since then I have found out that a chain is better than a stick, and it must be as loose as it can be but not loose enough for the cow to get it out of its mouth. I have never dosed a cow for this and never had to use a trocar and have not lost any by blowing on clover or lucerne."

LIST OF REGISTERED STALLIONS.

Subjoined is a list of stallions in respect of which Certificates of Registration were issued under "*The Stallions Registration Acts, 1923 to 1932*," during the year 1933-34.

BLOOD STALLIONS CERTIFICATED FOR THE YEAR 1933-34.

Name.	Description.	Age.	Owner.
Addenda	Brown	3	G. Fogarty, Toowoomba
Amberheart	Bay	4	C. Phillott, care of A. G. Anderson, Hendra
Arboreal	Bay	3	M. Ryan, Ascot Chambers, Edward street, Brisbane
Armlic	Bay	4	W. R. Downing, Moolboolaman, Mount Perry Line
Arundel	Bay	5	P. Docherty, Merlin, Prairie
Bachelor's Echo	Bay	4	W. May, Clifton
Bachelor's Heir	Chestnut	3	K. Brennan, Boonah
Bachelor's Lodge	Bay	3	A. McAlpine, Cambooya
Bay Crystal	Bay	3	W. J. Langmore, Jondaryan
Black Guard	Brown	3	E. H. Mannion, West street, Rockhampton
Bob's March	Chestnut	Aged	J. W. Collins, Beaudesert
Boropolis	Bay or brown	3	P. J. Carroll, Newmarket street, Hendra
Brown Peter	Brown	3	Forest Vale Station, Mitchell
Byramjee	Brown	3	C. Bonham, care of C. O'Connell, Hendra
Centauri	Chestnut	4	F. E. Cobbold, care of A. G. Anderson, Hendra
Colloseum	Chestnut	3	W. Glasson, Umbiram
Dalmain	Bay	3	A. P. Gibson, Boolboonda
Dennis Lad	Chestnut	3	G. E. Crane, Elbow Valley, Warwick
El Joven	Bay	3	E. L. Ramsay, Cambooya
Exaltation	Brown	3	I. Freedman, Brunswick street, New Farm
Flying Painter	Bay	3	W. T. Gillies, Cooyar
Forceona	Grey	3	R. J. Spence, Muttaburra
Grand Revel	Bay	Aged	E. W. Sauer, Gayndah
Gunborough	Black	3	T. Kidd, Windorah
Guy Fawkes	Chestnut	3	J. P. Walsh, Mount Perry
Happy Returns	Bay	3	E. W. Walker, Oakey
High Exchange	Bay	4	W. H. Reynolds, Winchester street, Hamilton
High Gain	Brown	3	White and Rees, Surat
High Score	Brown	3	W. H. Anderson, care of A. G. Anderson, Hendra
High Standard	Brown	4	J. W. Wallace, Doncaster street, Toowoomba
Jehad	Chestnut	3	W. G. Hein, James street, Howard
Jokulsa	Black	3	E. L. Ramsay, Cambooya
Kelloshiel	Bay	4	H. B. Rankin, Tiree, via Aramac
Kengoon	Bay	3	A. G. Anderson, Hendra
King Baralong	Bay	3	D. C. Cameron, Le Geyt street, Windsor
Kintrockat	Brown	4	E. L. Ramsay, Cambooya
Layman	Chestnut	3	J. Redman, Wondai
Leolita	Bay	3	T. Jennings, Greenmount
Mane Berd	Bay	3	Derlin and Tilley, Kalbar
Marco Day	Brown	3	W. H. Richards, Pelican, Chinchilla
Meleager	Brown	3	M. Ryan, Ascot Chambers, Edward street, Brisbane
Modestre II.	Brown	5	A. E. Charles, Warrington, Inglewood
Mr. Speaker	Bay	4	T. J. Brosnan and I. J. Moore, Hendra
Night Piper	Brown	4	L. R. Lay, Prince street, Ascot
Oregyn	Chestnut	4	A. Adie, Childers
Pantheism	Bay or brown	4	W. Mace, Torilla Station, *via* Rockhampton
Pat Clyde	Bay	4	A. R. Taylor, Cecil Plains
Poitrel's Will	Bay	3	R. Betts, Boonah
Prince Fox	Brown	4	W. Donovan, Belah, Inglewood
Quertoi	Chestnut	Aged	D. Brennan, Jimboomba
Real Flyer	Brown	3	W. A. Tucker, Bowley street, Hendra
Rightaway	Brown	4	E. E. D. White, Charters Towers
Scotch Force	Bay	3	B. Wagner, care of Marylands, St. Lawrence
Seaforth	Chestnut	4	L. A. Mackenzie, Dingo
Sea Laddie	Bay	3	J. Cunningham, Furmiston, *via* Warra
Serewick	Brown	3	T. J. Campbell, Kolonga, Gin Gin
Sir Bluewin	Brown	3	M. Brosnan, Dragon street, Warwick
Soft Step	Brown	3	W. J. Tucker, Bowley street, Hendra
Southern Don	Chestnut	3	D. A. Proctor, Glen Valley, Byrnestown
Spearall	Brown	5	P. J. Mayne, Forest Park, Warwick
Star Deer	Dark-bay	4	W. J. Noud, Kent street, Hamilton
Strange Idea	Dark-chestnut	4	A. G. Anderson, Hendra
Syce Lad	Bay	4	E. Wallace, Cania, *via* Monto
Warwick Eye	Black	3	G. Reinke, Minden
Windborough	Bay or Brown	3	W. B. Beal, Harriman Park, Cunnamulla
Wittablus	Chestnut	3	C. Bergmann, Witta
Wydells	Bay	Aged	J. E. Fox, Collinsville
Young Maloola	Brown	4	P. Jeppson, Paterson, N. C. L.

TROTTER STALLIONS CERTIFICATED FOR YEAR 1933-34.

Name.	Description.	Age.	Owner.
Bricklayer	Bay	3	Morrell Bros., Elphinstone
Broadarrow	Bay	4	F. T. Walker, Darriwell, *via* Bell
Broadcast	Brown	4	E. Rickerts, Walker street, Bundaberg
Cedarwood	Black	3	J. C. Schweikert, Yandilla
Gay Night	Brown	4	M. Robeck, Rockside, Gatton
Sir David	Bay	3	H. C. Gooding, Benowa, Southport
Vale Opera	Chestnut	3	L. T. Graham, Goomeri

PONY STALLIONS CERTIFICATED FOR YEAR 1933-34.

Ding Dong	Bay	4	J. C. Mann, Pittsworth
Ebony	Black	4	E. Taylor, Fletcher
Eclipse	Taffy	4	M. J. Mullins, Goomburra
Guina	Chestnut	3	T. H. Welke, Kleinton
Little Mischief	Chestnut	3	R. Humphreys, Rosedale
Pento	Cream	4	A. Skyring, Kinbombi
Petite's Pride	Bay	4	A. O. Harm, Byee, Murgon
Sandy	Cream	4	J. Connors, Gundiah
Sir Pastel	Brown	3	D. R. Hutton, Cunningham
The Black Joke	Black	4	A. J. Salsbury, Duaringa
Tibby	Brown	4	H. Weigel, Hatton Vale
Tom Thumb	Chestnut	4	C. Donovan, Laidley
Young Guinea	Bay	3	H. H. Ehirich, Douglas, *via* Goombungee

DRAUGHT STALLIONS CERTIFICATED FOR YEAR 1933-34.

Banker	Bay	3	G. E. Bassingthwaite, Rosevale, Jandowae
Barney II.	Bay	4	W. Mow, Kurrumbul
Baron Favour	Bay	3	J. M. Newman, Caboolture
Baroona Musketeer	Chestnut	3	E. Mussing, Pomona
Bay Baronet	Bay	4	Mulholland Bros., Gympie
Beau Ideal	Bay	4	P. J. McCauley, Neurum
Belted Knight	Dark-bay	3	G. S. Miller, Upper Freestone
Ben	Bay	3	F. P. Alexander, Inveral, *via* Warra
Ben	Bay	3	V. Trott, Reid Creek, Gayndah
Ben Dale	Bay	3	R. E. McEwan, Cedar Creek, Pittsworth
Ben Hur	Black	3	R. C. Jefferies, Johnstown
Billy	Bay	3	H. Litherland, Beaudesert
Black Watch	Black	4	Fairymead Sugar Co., Bundaberg
Bob	Brown	4	A. Kunde, Kilcoy
Bold Boy	Bay	3	L. A. Armstrong, Rosewood
Bold Hero	Bay	3	G. Day, Grandchester
Boondandilla	Brown	4	C. Wright and Sons, Kindon, Goondiwindi
Bownce	Bay	3	W. H. Louttit, Windera
British Earl	Bay	3	P. G. Wilkie, Gayndah
Briton	Bay	4	R. Chandler, Forest Springs, Clifton
Captain	Bay	4	W. G. Rudd, Mudgeeraba
Captain	Brown	4	D. McCarroll, Murrumba
Captain Duke	Brown or black	3	F. Horne, Linville
Carlyle Prairie	Bay	3	T. W. Green, Jandowae
Chancellor	Bay	4	S. A. Plant, Trevanna, Cooyar
Charlie Boy	Bay	4	J. Wass, Rosewood
Clyde Prefect	Bay	3	J. S. Love, Townsville
Colonel	Bay	3	H. W. Zleball, Dalkeith, Mount Tyson
Crystal Boy	Bay	3	S. Webster, Kilcoy
Crystal Duke	Bay	3	J. Kennedy, Kumbia
Don Robin	Bay	3	W. F. Peters, North Maclagan
Double Top	Bay	Aged	C. J. Nielson, Yangan (Provisional)
Duke	Bay	4	A. Kahker, Gahan
Duke Dale	Brown	3	C. Tillack, Hatton Vale
Duke of Invermay	Bay	3	W. Richardson, Clifton
Duke of Sunnyside	Bay	4	W. F. Burge, Gomoran, Goombungee
Edgecombe Prince	Bay	3	J. W. Ritter, Mount Tyson
Farmer's Glory	Bay	3	F. Abraham, Lark Hill, *via* Walloon
Firedale	Bay	3	Fairymead Sugar Co., Bundaberg
Gindie Boy	Chestnut	4	G. L. Opperman, Ormeau
Gladfield	Black	3	P. W. Flynn, Redland, Clifton
Glen Dale	Bay	4	H. Truloff, Minden
Glenmore	Bay	4	F. P. Alexander, Inveral, *via* Warra
Heather Dale	Black	3	W. F. Whitney, Cowra
Hendon Bill	Brown	3	G. H. Clarke, Allora
Highland Boy	Bay	4	M. G. Topfer, Myury Villa, *via* Oakey
Highland Chief	Black	4	A. A. Treasure, Brigalow
Iron Duke	Grey	3	A. E. Missen, Clifton
Jondaryan Carlisle	Bay	3	H. J. Steinhardt, Marburg
Jondaryan McIntyre	Bay	3	J. Sproule, Lilienthorp
Jondaryan Wee Mac	Bay	3	W. B. Simpson, Hughenden
King Godfrey	Bay	4	J. W. Rush, Dulacca
Kingsford	Bay	Aged	W. P. Hyde, Nanango (Provisional)
King Wyllie	Chestnut	Aged	W. M. Hubbard, Chinchilla
Knight Abbit	Brown	4	P. G. Ruhle, Motley

DRAUGHT STALLIONS CERTIFICATED FOR YEAR 1933-34—*continued*.

Name.	Description.	Age.	Owner.
Lion	Bay	3	J. J. and D. W. Shine, Fernvale
Lion	Bay	4	A. Langton, Bunya Mountains, Dalby
Lochaber Lad	Bay	3	T. Laidler, Mundubbera
Lockyer Premier	Bay	3	C. Mahomet, Casino
Lord o' the Hills	Bay	4	E. Hindmarsh, Lyra, Stanthorpe
Lord Wallace	Bay	4	A. O. Harm, Byee
Lord Wheeler	Bay	3	C.Q.M.E. Co., Ltd., Lake's Creek
Major Wallace	Bay	4	Gross Bros., Campbell's Plains, Warwick
Monarch	Bay	4	J. C. Evans, Moola
Monarch	Brown	3	C. Head, Yangan
Newtown Baron	Bay	3	J. R. Anderson, Southbrook
Nobby's Pride	Bay	4	L. Ferguson, Nobby
Noble	Bay	3	J. W. Schultz, Coal Creek
Noble	Brown	3	R. G. Alexander, Inverai, *via* Warra
Oriato	Bay	4	C. Howe, Beebo
Patent	Brown	3	G. L. Opperman, Ormeau
Premier's Pride	Dark-brown	4	P. E. Muckert, Gueena, Murgon
Prince	Bay	4	R. Williams, Kingaroy
Punch	Black	4	G. H. Fowler, Pittsworth
Punch	Brown	3	O. Reinke, Rosewood
Retaliator	Bay	3	T. J. Brosnan, Killarney
Rising Son	Bay	4	T. Dingle, Drummer's Creek
Royal	Bay	4	E. H. Hahn, Coulson
Royal Blue	Blue-grey	4	W. P. O'Sullivan, Ascot, *via* Greenmount
Royal Chance	Dapple-bay	4	W. J. Prosser, Kulpi
Royal Dale	Bay	4	O. P. Kanofski, Amberley
Royal Jock II.	Bay	4	R. W. and O. Kleinschmidt, Woongoolba
Royal Prince II.	Bay	3	G. S. Mant, Brooweena
Royal Prince	Bay	3	W. G. Bedgood, Crow's Nest
Sailor	Bay	3	E. M. Tong, Boynewood
Sergeant's Orphan	Brown	4	A. Kubler, Boonah
Shepherd's Pride	Bay	4	G. E. Crane, Elbow Valley, Warwick
Sheppard Prince	Bay	6	S. T. Evans, Chinchilla (Provisional)
Sir Douglas	Bay	4	Honey and Braithwaite, Murgon
Special Mac	Bay	3	W. J. Borchert and Son, Murgon
Square Dale Yet	Bay	4	A. Jansen, Swanfels, Warwick
Star	Blue-roan	3	W. Johnston, Strathpine
St. Helen's Bruce Dale	Bay	3	C. B. Baxley, Dalby
St. Helen's Lauder Dale	Bay	3	C. E. Lock, Back Plains, Clifton
St. Helen's Piper	Bay	4	S. A. Porrett, Flinders
St. Helen's Rob Roy	Bay	4	M. Gould, Yarraman
Studleith Premier Lad	Bay	3	G. P. Walker, junr., Helidon
Talgai Refiner	Black	3	H. C. Sprott, Ellenthorp
Talgai Wallace	Brown	4	W. Profke, Glamorgan Vale
The Intent II.	Bay	4	M. Gould, Neumgna
The Rajah	Brown	4	Jas. Love, Townsville
The Tent	Black	3	J. Love, Townsville
Tony	Bay	3	R. Bryce, Wootha
Wallace	Bay	3	G. Stanfield, Proston
Wallace	Bay	5	J. Braithwaite, Chinchilla (Provisional)
War Dale	Bay	3	F. G. Turner, Inverell
Wilga King	Bay	3	F. W. Goodall, Milmerran
Warawingeth Dignity	Bay	4	A. F. Creswick, St. Helen's, Pittsworth
Worthy Carlisle	Bay	3	J. Lehmann, Coolana, Rosewood
Worthy Craig	Bay	4	Wilson and Janson, Yandina
Young Baron's Pride	Bay	4	A. Hammond, Swan Creek
Young Kingsford	Bay	3	Scott Bros., Toogoolawah

BLOOD STALLIONS CERTIFICATED FOR LIFE DURING THE YEAR 1933-34.

Algiers	Bay	6	J. M. Newman, Caboolture
Ambercot	Chestnut	Aged	J. O. Kyffin, Acland
Amberwee	Bay	6	C. Hansen, College street, Ascot
Ante-Up	Dark-bay	5	W. Rankin, Toowoomba
Ardbern	Bay	6	R. G. L. Boxsell, Taylor street, Toowoomba
Auburn King	Chestnut	6	W. Feverlegel, Bald Hills
Ayr Nut	Chestnut	Aged	M. Muller, Wowan
Banistar	Brown	6	H. G. Young, Mount Stanley
Bevallas	Bay	Aged	H. V. Webster, Glenview, Berajondo
Black Apple	Black	5	P. L. Murray, Gunalda
Boebridge	Chestnut	Aged	J. W. Royan, Isis Central Mill, Childers
Bonnement	Bay	Aged	J. H. S. Barnes, Canning Downs, Warwick
Canonbie	Chestnut	Aged	T. Bishop, Rocky Glen, Cooyar
Carnival	Black	Aged	C. A. Barnard, Duaringa
Clever Laddie	Bay	5	R. G. Talbot, Ripplebrook, St. Lawrence
Clyde Scholar	Brown	6	G. Wilson, Yangan
Coondarra	Bay	5	C. Wright and Sons, Kindon, Goondiwindi
Corban, imp.	Bay	Aged	J. F. Jennings, Greenmount
Corban II.	Bay	5	M. Cavanagh, Hawkwood
Craftdancer	Chestnut	Aged	B. C. McNairn, Peachey

BLOOD STALLIONS CERTIFICATED FOR LIFE DURING THE YEAR 1933–34—*continued.*

Name.	Description.	Age.	Owner.
Daplin	Brown	6	J. C. Stockden, Cinnabar
Dear Sir	Bay	6	H. Spencely, Winton
Deerborough	Chestnut	Aged	A. H. Maguire, Kialla, Greenmount
Devonus	Brown	5	J. B. Shannon, Tooloombah
Dick Syce	Bay	Aged	T. Laidler, Mundubbera
Disclaim	Chestnut	Aged	J. B. Shannon, Tooloombah
Don Devas	Bay	Aged	J. M. Kennedy and Co., Wigton, Wondai
Emrix	Brown	5	E. K. Rideout, Mount Larcom
Friction Gun	Grey	5	T. J. Tobin, Daylsford
Gold Fern	Chestnut	Aged	J. J. Johns, Yeerongpilly
Grand Alliance	Bay	Aged	W. J. Lloyd, Harrow, Cambooya
Grey Tie	Bay	Aged	Walloon Pastoral Co., Walloon
Hebrus	Chestnut	Aged	J. P. Rodgers, Redfield, Talwood
High Airs	Brown	5	C. Lawton, care of A. G. Anderson, Hendra
Highland Nectar	Black	Aged	T. H. Murray, Rockhampton
Hop On	Brown	Aged	J. Wade, Gundiah
Hopover	Chestnut	Aged	H. J. Hyne, Maryborough
Hycon	Bay	6	P. Martin, Nudgee road, Hendra
Jo Jo	Bay	Aged	J. W. Sutherland, Inglewood
Kenilworth Mac	Chestnut	5	R. J. Barry, Jandowae
King Adorn	Bay	5	W. H. Kirk, Mundubbera
Kingspear	Brown	Aged	L. W. Fuymer, Silverspur
Laddie	Bay	5	C. Brooker, Swanfels
Listowel	Chestnut	Aged	J. H. Walker, Oakey
Lord Assam	Bay or Brown	Aged	Estate of C. A. Munro, Silverspur
Lord Leebius	Chestnut	Aged	J. Hunter, Yarraman
Lord Paddington	Bay	Aged	F. Beckmann, Plainview
Luigi	Chestnut	Aged	W. Gunn, Kildonan, Goondiwindi
Mat Syce	Bay	6	M. Kavanagh, Hawkwood, Mundubbera
McIntyre	Brown	5	H. B. Wilson, Covea, *via* Tingoora
Mecca	Bay	5	F. J. Watts, Yangan
Midwick	Chestnut	Aged	Scott McLeod, Inglewood
Minbar	Brown	5	W. J. Hampson, Cloyne, Goomeri
Mintnut	Bay	6	S. S. Webb, Neil street, Toowoomba
Monsildale	Brown	6	J. M. Kennedy, Villiers street, New Farm
Mote	Chestnut	Aged	Leonard and Sons, Welltown, Goondiwindi
Mr. Patience	Bay	5	C.Q.M.E. Co., Lake's Creek
Noble Deed	Chestnut	5	A. Pfingst, Glen Vale, Warwick
Noel Soldat	Bay	5	D. C. Cameron, Le Geyt street, Windsor
Nubian	Black	6	B. R. Lawless, Windera
Oatshell	Chestnut	Aged	C. Martin, Kumbarilla
Ocean Force	Bay	5	M. A. Gargett, Sandgate
Olive Steel	Chestnut	Aged	J. F. O'Sullivan, Wallaville
Omaga	Black	Aged	J. B. Shannon, Tooloomba
Opal Dean	Chestnut	Aged	M. McKenzie, Mooroondan
Pat Doolan	Bay	Aged	F. Jurgs, Cecil Plains
Pershay	Bay	Aged	Mrs. Bernicke, Pilton
Policastro	Chestnut	Aged	J. W. McKenzie, Dingo
Polmania	Bay	5	J. Docherty, Caraki, New South Wales
Prince Seremond	Brown	Aged	R. Hill, Unumgar, New South Wales
Ramazan	Chestnut	Aged	J. N. Lane, Pomona
Red Robin	Chestnut	Aged	W. H. Thrupp, Roma
Royal Foote	Bay	5	D. A. Wormwell, Meandarra
Royal Heather	Brown	Aged	McKenzie Bros., Alton Downs
Roysterer, imp.	Brown	Aged	T. J. Turkington, Wattlebrae, Pilton
Shell Shock	Chestnut	Aged	A. M. Cadell, Limevale
Shoulder Arms	Bay	5	Mary E. McGhee, Berajondo
Star Arrow	Chestnut	Aged	J. D. Stirrat, Mount Larcom
Sun Eagle	Brown	6	P. Reynolds, Richmond, New South Wales
The Buzzard, imp.	Bay	Aged	J. G. McDougall, Lyndhurst, Warwick
Tiny Mack	Chestnut	Aged	J. H. Truce, Brooklands, Kingaroy
Trent Simon	Chestnut	5	A. Perrett, junr., Elgin Vale
Tressador	Chestnut	6	C. Blume, Hamilton
Unumgar	Brown	Aged	J. V. Carrigan, Toobeah
Wayland Debs	Brown	5	J. Shanahan, Jane street, Ascot
Wise Force	Bay	Aged	D. W. McDougall, Dulacca West

TROTTER STALLIONS CERTIFICATED FOR LIFE DURING THE YEAR 1933–34

Belmont Prince	Bay	5	G. Klaasen, Scarborough
Burgy Bee	Bay	Aged	R. Crooks, Allora
Don Harum	Black	Aged	T. H. Crust, Esk
Dux Wilkes	Brown	Aged	A. Oelrichs, Mount Mee
Grand Opera	Bay	Aged	F. H. Ploch, Maryborough
Rex Delavan	Brown	Aged	R. Limberg, junr., Esk
Ribbon Bells	Dark-bay	5	F. Knecker, Bowen street, Annerley
Some Jewels	Brown	5	E. J. Wallin, Deception Bay
Woodhall	Bay	Aged	H. Wise, Kilcoy
Young Afghan	Brown	Aged	W. H. Lee, Nudgee

PONY STALLIONS CERTIFICATED FOR LIFE DURING THE YEAR 1933–34.

Name.	Description.	Age.	Owner.
All Black	Black	Aged	H. Klotz, Yandina
Auto Pay	Black	Aged	S. Russell, Chinchilla
Bennie	Chestnut	5	M. L. Horan, Inverlaw, Kingaroy
Billy Hughes	Chestnut	6	D. J. Wyllie, Canaga
Black Paddy	Black	Aged	D. P. McColm, Warwick
Blue Light	Bay	5	J. Russell, Lusitania street, East Ipswich
Comrade	Bay	Aged	F. L. Hampson, Cania
David	Grey	Aged	D. England, Gympie
Eclipse	Mouse	Aged	L. R. Martin, Kumbarilla
Faraam Mercury, imp.	Dapple-grey	Aged	J. M. Newman, Caboolture
Gold Fire	Chestnut	5	L. B. Evordell, Woodhill
Guinea	Chestnut	Aged	S. S. Webb, Neil street, Toowoomba
Japoon	Taffy	Aged	C.Q.M.E. Co., Lake's Creek
John Bull	Brown	5	H. G. Blair, junr., Harlin road, Ipswich
Little Dick	Taffy	Aged	O. W. Limberg, Esk
Little Don	Bay	6	C. Jose, New Moonta
Mac's Pride	Bay	5	S. H. Reynolds, Glasgow street, Toowoomba
Master Cupid	Black	5	J. Ryan, Stanthorpe
Mischief	Bay	Aged	W. Kruger, Jandowae
Mischief	Bay	Aged	A. Rae, Tirroan
Peter Pan	Chestnut-roan	5	C. M. Smith, Gatton
Play Boy	Black	5	J. Mullins, Mill Hill
Polo II.	Bay	5	F. G. Collins, Rosedale
Prince Michael	Taffy	Aged	T. R. Gordon, Kenilworth
Romulus	Light-chestnut	Aged	S. B. Trigger, Hopewell, Lakeside
Small Boy	Chestnut	Aged	R. McLean, Watalgan
Steele Rudd	Grey	Aged	A. G. A. Spencer, Glen View, *via* Yandina
The Hero	Bay	Aged	J. H. Atherton, Miva
Tim	Black	Aged	R. L. Boyd, Byrnestown
Tomboy	Brown	Aged	Mrs. E. T. Thompson, Calliope
Tom Thumb	Brown	Aged	E. H. Mann, Gooroolba
Uncle Mary	Dark-roan	Aged	L. Hughes, Childers
Victor Kelso	Brown	Aged	J. J. Tobin, Daylsford
Wee McKinney	Black	Aged	J. P. Ruhle, Motley, *via* Oakey
Young Wee McGregor	Black	Aged	W. J. Brazier, Jandowae

DRAUGHT STALLIONS CERTIFICATED FOR LIFE DURING THE YEAR 1933–34.

Admiration	Bay	Aged	E. W. Genrich, East Cooyar
Again Champion	Black	Aged	J. Stenzel, Carney's Creek, Boonah
Ardlaw's Heir	Bay or brown	Aged	J. Sprott, Ellenthorp
Ballora	Bay	Aged	A. F. Hale, Eidsvold
Baronet	Brown	Aged	P. A. Todd, Biggenden
Baron Boy	Bay	Aged	G. H. Smith, Amamoor
Baron Bruce	Bay	5	S. Brown, Howard
Baron Sheriff	Bay	Aged	A. C. V. Bligh, Brookstead
Baron Wyllie	Bay	5	A. J. Edwards, Spring Valley, Kingaroy
Baron's Pride	Bay	Aged	C. B. Euler, Goomeri
Ben Alder	Bay	Aged	E. P. Campbell, Woombah, Mount Perry Line
Black Prince	Black	6	D. Stark, Anduramba
Bold Bill	Bay	5	J. Bowling, Coolabunia, Kingaroy
Bold Knight	Black	5	Fairymead Sugar Co., Bundaberg
Boree Fame	Brown	Aged	A. M. Cadell, Limevale
British Joy	Brown	Aged	J. P. Wormwell, Greenbank, Tara Line
Bruce	Bay or brown	Aged	Jas. Goodman, Stanwell
Bull	Bay	Aged	C. A. Munro Estate, Silver Spur
Captain Campbell	Bay	6	R. W. Henney, Symsdale, Bell
Chieftain	Grey	5	J. D. Stirrat, Mount Larcom
Chummy	Grey	5	J. McAulay, Hive Camp, Goomeri
Clyde	Bay	Aged	H. Rattey, Jandowae
Clyde Shepherd	Bay	Aged	J. V. Willis, Cooby Creek, Meringandan
Colonel of Kilbirnie	Bay	5	McFarlane Bros., Radford
Craigie Willie	Bay	Aged	A. Adie, Childers
Crystal Hope	Black	5	Galloway Plains Pastoral Co., Calliope
Crystal MacBride	Bay	5	H. A. Free, Ascot, *via* Greenmount
Crystal Spot	Bay	5	T. Clark, Nagoorin
Crystal Tom	Chestnut	Aged	J. F. Hubert, Mungar Junction
Crystale Vale	Chestnut	Aged	M. Betts, Guy street, Warwick
Darnley	Bay	Aged	J. L. Richards
Dew of Whitecliff	Grey	6	C. Anger, Duaringa
Donald	Grey	Aged	A. Ziebarth, Biloela
Duke	Bay	Aged	H. and F. Mason, Gurulmundi
Duke of Huntleigh	Chestnut	Aged	C. Ballin, Tallegalla
Dundonald III.	Black	Aged	Estate of J. Wason, Kilkivan
Endeavour	Bay	Aged	J. F. Hegarty, Silverwood, Brookstead
General Intent	Bay	5	J. T. Wade, Boompa
General Prince	Bay	Aged	H. Newton, Square Top, Bell Line
Gindie Majesty	Chestnut	Aged	H. G. Zipf, Norwell
Glencoe	Brown	Aged	W. Johnston, Kerry
Glen Dale	Black	6	H. Werherspoon, Glenmore, Kulpi
Glenelg	Bay	6	J. Wade, Gundiah
Glengarry	Bay	5	Estate of late P. C. Anderson, Wondai
Glen King	Bay	6	W. Chard, Glengallen

DRAUGHT STALLIONS CERTIFICATED FOR LIFE DURING THE YEAR 1933-34—*continued.*

Name.	Description.	Age.	Owner.
Glenmore	Bay	Aged	E. J. Cross, Berajondo
Glenroy	Black	Aged	L. Dascombe, Newland, Haden
Glen Roy	Bay	Aged	C. Kiepe, Stockyard Creek, Helidon
Glory	Brown	Aged	N. Thornton, Rocky Creek, Milmerran
Hendon Hope	Bay	Aged	D. A. Proctor, Byrnestown
Highland Chief	Bay	Aged	J. D. Learmonth, Hill View, Pittsworth
Hillview Jock	Black	6	R. J. O'Brien, Pullen Vale
Hudson	Bay	6	W. J. Agnew, Elphinstone
Johnie Walker	Bay	Aged	M. Jensen, South Kolan
King Dale	Brown	5	E. C. H. Zillman, Hatton Vale, Laidley
King Tom	Bay	5	A. Pfingst, Glen Vale, Warwick
Kitchner	Brown	5	T. J. Coleman, Toogoolawah
Lord Robert	Bay	Aged	Turner and Munro, Wyaga, Goondiwindi
Loyal George	Bay	Aged	J. E. Lysaght, Maryvale
Majestic	Bay	Aged	S. B. Trigger, Hopewell, Lakeside
Major	Bay	6	St. Vincent's Orphanage, Nudgee
Major	Grey	Aged	A. E. Pechey, Pechey
Major	Bay	5	J. Sinclair, Glencoe, Eidsvold
Major Dale	Bay	5	D. J. Crowley, Crowley Vale
Major Dale	Bay	5	D. W. McDougall, Dulacca West, Jackson
McGregor	Bay	5	E. Frain, Miles
Nelson	Bay	Aged	A. J. Telford, Cambooya
Noble Prince	Dark-bay	6	R. Stark, Wondai
Pilot	Bay	Aged	J. H. Rogash, Goomeri
Ploughboy	Bay	Aged	W. E. Cockerill and Son, Boyne River, *via* Tingoora
Premier	Bay	Aged	A. F. Kerkow, Byee
Pride of Glen Cairn	Bay	Aged	E. G. Henderson, Sexton
Pride of the Mount	Bay or brown	Aged	S. G. Wagner, Kilcoy
Prince	Bay	Aged	D. Hinchcliffe, Yaamba
Prince	Dark-bay	Aged	Hunter Bros., Mount View, Cinnabar
Prince	Bay	Aged	W Stead, Cecil Plains
Prince Arthur	Bay	Aged	F. Prior, Wolca, Mount Perry Line
Prince Carlyle	Bay	Aged	A. Sippel, Redgate, Murgon
Prince Charles	Chestnut	Aged	J. Coss, Brigalow
Prince Dale	Brown	5	F. C. Manz, Lockrose
Prince Jelbyn	Bay	6	Walsh Bros., Beaudesert
Prince of Glenore	Brown	5	Ducat Bros., Tweed Heads
Prince of Springview	Bay	5	M. Dingwall, Gunnewin
Proston Lad	Bay	6	J. Bonsfield, care of J. Mitchell, Proston
Punch	Bay	Aged	H. Hill, Flaggy Rock
Punch	Brown	Aged	Margaret McGrath, Nankin Junction
Punch	Bay	6	P. Hunt, Warra
Renown	Bay	Aged	R. V. Breydon, Haden
Rising Heir	Bay	Aged	T. Dingle, Drummer's Creek
Robin Adair	Bay	Aged	M. C. Bishop, Glengowrie, Maidenwell
Royal Prince	Black	Aged	G. H. A. Koeler, Yamsion
Royal Robert	Bay	6	W. Donald, Booyal
Royal Scot	Bay	Aged	R. Humphreys, Rosedale
Ruben	Bay	5	E. I. Wallace, Fairview, Biloela
Scottish Hero	Roan	5	D. C. McWilliam, Alfalfa, Leyburn
Sir Garnet	Brown	Aged	J. H. Atherton, Miva
Sir William	Bay	Aged	B. Oberhardt, Pittsworth
Spark	Brown	5	R. M. Bell, Eskdale
Speewarmick	Bay	Aged	M. Muirhead, Pittsworth
Springmead Bright Laddie	Brown	Aged	W. A. Embrey, Tallegalla
Springside Trooper	Brown	Aged	R. E. Clay and Sons, Samson Vale
Talgai Leader	Dark-bay or brown	6	J. Sprott, junr., Ellenthorp
Talgai Pride	Bay	5	H. R. McIlveen, Giddi Giddi, Gooray
Tamar Mail Boy	Bay	5	A. Kubler, Boonah
Tiger	Bay	5	J. Tobin, Currajong
Vampire	Bay	Aged	F. A. Schelbach, Harrisville
Victory	Bay	Aged	H. E. M. Leggett, Gayndah
Wallace Lad	Bay	5	C. E. Morgan, Windera, *via* Murgon
Worthy Mac	Brown	Aged	Jondaryan Estate Co. of Australia, Ltd., Jondaryan
Wylie's Knight	Bay	Aged	E. Reinbott, Booie
Young Grafter	Bay	Aged	M. F. Kirstenfeldt, Nutgrove, Cooyar Line
Young Prospector	Brown	5	L. A. Teske, Mount Beppo

List of stallions in respect of which Certificates of Registration were refused on account of either unsoundness or lack of type and/or conformation during the year 1933-1934. These horses are prohibited from service, either public or private.

BLOOD STALLIONS REJECTED DURING THE YEAR 1933-34.

Abbey Boy	Bay	4	H. O. Mischke, Veradilla
Alstar	Bay	Aged	W. J. Davey and Sons, Mimosa, Raglan
Araby	Light-bay	6	Messrs. Kessell and Worthington, Bororen
Barmoor	Brown	5	J. D. Lawless, Goomally, Duaringa
Black Spring	Brown	Aged	A. L. McDonald, Yaamba
Blue Monk	Grey	Aged	F. F. Doyle, Nogo River Junction, Ceratodus
Flying Fox	Bay	6	A. Kundy, Kilcoy
Gay Eiffle	Bay	4	W. Caldwell, Highlands, Bell

BLOOD STALLIONS REJECTED DURING THE YEAR 1933–34—*continued.*

Name.	Description.	Age.	Owner.
Gold Arm	Bay	6	P. Kerwick, Edward street, Dutton Park
Gold Mat	Chestnut	6	D. H. Proctor, Glen Valley, Byrnestown
Handsome Lad	Black	Aged	J. H. Blair, Harlin road, Ipswich
Hyman	Chestnut	Aged	H. Goodman, Stanwell
Jim Boy	Chestnut	Aged	C. S. Curtis, Tanby, Tungamull
Jimmy Jocks	Bay	Aged	W. Cadwallader, Swanson Park, Tungamull
Kelso	Brown	Aged	J. Ross, Eukey
Ladysal	Bay	Aged	H. Hancock, Killarney
Lancer	Bay	4	H. A. Burgess, Miriam Vale
Lord Ascot	Brown	Aged	J. Ward, Harrisville
Matterhorn	Chestnut	Aged	E. P. Itzstein, Hyde Park, Gooroolba
Mintoi	Bay	4	S. Schneider, Boonah
Monty	Chestnut	Aged	W. J. Park, Bli Bli P.O., *via* Nambour
My Gun	Black	4	C. O'Brien, Cabbage Tree, Ipswich
Narell	Chestnut	4	M. Coonan, Pittsworth
North Kerman	Bay	3	A. J. Lubke, Glamorganvale
Painter Russe	Bay	Aged	Mrs. Breydon, Haden
Persse's Promise	Chestnut	5	P. Ryan, Viewland, Gatton
Peter Pan	Bay	3	A. A. Young, Bristol Vale, Kinka
Peter the Silent	Chestnut	3	W. Pholi, Coraki, New South Wales
Pi Laddie	Bay	Aged	J. H. Furney, Dingo
Robin Hood	Bay	4	A. A. Treasure, Brigalow
Rosselah	Bay	Aged	Mrs. C. L. Davey, Roundstone, Baralaba
Sycebius	Brown	Aged	C. W. Mills, Nerang
Sercfugle	Chestnut	Aged	J. P. Wormwell, Greenbank, Kuipunn
Syce Knight	Chestnut	Aged	W. Grieve, Brookstead
Tom Turpine	Chestnut	5	F. M. Postich, River road, Warra
Unnamed	Chestnut	Aged	A. G. Lawrie, Evergreen, Westwood
Unnamed	Brown	4	J. W. Irwin, Redcliffe, Baralaba
Unnamed	Bay	Aged	A. Dunlop, Esk
Unnamed	Brown	3	A. W. Lord, Mount Stanley, Linville
Viceroy	Chestnut	6	H. G. F. Schneider, Mountain View, St. Lawrence
Wee General	Brown or black	Aged	J. Nolan, Baralaba
Welcome	Brown	Aged	R. Gross, Raglan
Winallan	Chestnut	4	D. M. Hay, Barmundu, Gladstone

TROTTERS REJECTED DURING THE YEAR 1933–34.

Comodore	Bay	4	J. W. Weedon, Biddeston
Prince Rapid	Bay or Brown	Aged	E. P. Macmillan, The Grange, Silkstone
Sheik	Chestnut	Aged	W. Gonchee, Esk
Steel Raven	Grey	5	R. A. Bowden, Pittsworth

PONIES REJECTED DURING THE YEAR 1933–34.

Joey	Black	4	D. Marschke, Bright View, Lowood
The Badger	Brown	5	W. J. Robinson, Esk
Unnamed	Brown	5	S. Dagg, Killarney
Unnamed	Brown	Aged	W. D. Draper, Duaringa
Windy	Bay	4	L. Lindenmayer, Milmerran

DRAUGHTS REJECTED DURING THE YEAR 1933–34.

Abbott	Brown	Aged	J. Barbour, Glen Ken, *via* Esk.
Ball	Bay	6	P. J. Maynes, Forest Park, Warwick
Bally	Bay	Aged	H. Williams, The Glen, Kingaroy
Barney	Bay	Aged	B. C. Cross, Drayton Park, Inglewood
Baron	Bay	6	G. W. Morgan, Childers
Baron Duke	Bay	Aged	A. L. Parkinson, Upper Koondaii, Bell
Baron Prince	Bay	4	Inglewood
Bellevue Harry	Bay	Aged	T. W. Caldicott, junr., Bellevue, Yandilla
Blaze	Brown	Aged	Dippelsman Bros., Allan, *via* Warwick
Blaze	Black	Aged	W. Christenson, Pacific View, Bororen
Blossom's Son	Brown	Aged	J. A. Kelly, Mount Crosby
Blue Speck	Grey	4	J. Childs, Bouldercombe
Bluff Wylie	Bay	3	M. Carlson, Lanefield
Bob	Brown	Aged	F. Maurer, Darra
Bounce	Bay	Aged	J. Peters, Esk
Boxer	Bay	Aged	D. W. Nolan, Roslyn Orchard, Burrum
Braw Laddie	Bay	Aged	D. M. Nielson, Gin Gin
British Lion	Bay	Aged	J. Mullins, Mill Hill
Bruce	Chestnut	5	W. R. Gordon, Gayndah
Captain	Bay	6	W. Draper, Duaringa
Captain Connor	Chestnut	3	Pomona
Charlie	Brown	6	W. Webber, Glen Eagle
Charlie	Bay	4	J. Ryan, Clifton
Cheeky	Bay	Aged	J. D. Bond, Wheatlands, Wondai
Chris	Bay	6	N. P. Dahl, and Sons, Cedars, Bororen
Craig Dale	Bay	6	T. Palmer, Greenmount
Crystal Clyde	Bay	4	C. J. Bradley, Quebec, Mundubbera

DRAUGHTS REJECTED DURING THE YEAR 1933-34—*continued.*

Name.	Description.	Age.	Owner.
Crystal Hero	Bay	4	J. D. Huston
Damsel's Star	Brown	Aged	C. J. Stack, Inglewood
Donald's Son	Brown	Aged	W. E. Webster, Sarum, Kingaroy
Don Pearce	Bay	3	C. J. Clarke, Royal Oak, Tiaro
Drummer	Brown	Aged	H. A. Buchbach, Yandaran
Duke	Brown	3	F. P. Stark, Wondai
Duke	Brown	Aged	J. W. Weedon, Giddeston, Oakey
Duke	Bay	4	M. J. Camac, Theodore
Duke of Argyle	Bay	Aged	G. Nicholls, Pratten
Dunure Dale	Bay or brown	Aged	C. A. Pitt, Boyland Station, Beaudesert
Farmer	Brown	6	F. Waelmer, Newington, *via* Jondaryan
General	Bay or brown	Aged	C. F. W. Beckmann, Mulgowie
General Touch	Bay	6	J. A. Collett, Pomona
Glancer II.	Brown	5	A. Krueger, Kalbar
Gret Stain	Grey	3	A. E. Rankin, Binbi, Duaringa
Grey Gown	Grey	Aged	J. O'Rourke, Greenmount
Hero	Bay	Aged	J. A. Carlson, Nikenbah
Ideal Ron	Bay	6	L. Wedemeyer, Eidsvold
Jack Wallace	Brown	Aged	A. H. Lowe, Bolier, *via* Kandanga
Jem	Chestnut	6	F. J. Stone, Currajong Creek, *via* Tirroan
Jim	Bay	6	A. H. and E. M. Kelland, Wowan
Joe	Bay	Aged	R. Bushnell, Ideraway
John	Bay	4	J. D. Wilson, Calliope Station, Calliope
Leo	Bay	..	W. Ford, Biggenden
Major	Chestnut	3	H. Nothdurft, Claremont, Oakey
Major	Bay	5	H. F. Blank, Kilcoy
Mark	Bay	..	J. Wood, Mount Chalmers, Tungamull
Monty of Glen Ian	Brown	4	S. H. Gralow, Theodore
Moor's Luck	Bay	4	F. M. Postich, River road, Warra
Mount Pleasant Wallace	Black	6	W. B. McLaughlin, Harrisville
Noble	Bay	6	G. Elliott, Sliepner Junction
Noble	Bay	Aged	Inglewood, South Downs
Nugget	Chestnut	Aged	E. W. Hill, Hillview, Beaudesert
Ploughby	Bay or brown	Aged	R. A. Filton, Kerry
Pride	Bay	Aged	J. J. Kessler, Cambooya
Pride	Brown	3	F. Niethe, Mundubbera
Pride of Glenmore	Black	Aged	W. C. Lund, Penshurst, Grandchester
Prince	Black	Aged	Archer Bros., Gracemere
Prince	Bay	..	R. J. Jenkins, Miva
Prince Chamberlain	Bay	Aged	C. F. Schmid, Pialba
Prince Tom	Bay	4	P. F. Schuh, Mount Perry
Punch	Bay	..	J. McLellan, Baralaba
Punch	Brown	5	B. Bradley, Ballandean
Punch	Bay	5	A. J. F. Gerchoo, Boonah
Richmond	Brown	Aged	A. Hanson, Amberley
Robin	Bay	Aged	J. Reif, Boonah
Robin Hood	Bay or brown	6	L. J. Clegg, Pratten
Rover	Bay	5	A. J. Specht, Tahara, Wellcamp
Royal Rolls Royce	Brown	Aged	J. Hardy, Eukey
Scottish Hope	Bay	3	A. C. Lawson, Deborah, *via* Netherby
Sir Oliver	Bay	Aged	H. Hiscock, Lochiel, Mulgeldie
Sir McIvar	Bay	5	F. B. Cory, Vermont, Warwick
Skipper	Bay	..	O. G. Draper, Tabooba
Spec	Bay	Aged	J. Russell, Chinchilla
Special	Brown	Aged	E. Cooper, Pratten
The Victor	Bay	5	K. Carew and W. E. Ivcar, Kingaroy
Tiger	Brown	Aged	J. Muir, Blackbutt
Toby	Bay	6	Kerr Bros., Warra
Tommy Burns II.	Bay	Aged	J. H. Elsebach, Gayndah
Torsdale	Bay	Aged	J. S. Fovold, Barmundu
Trooper	Bay	6	M. E. Young, Kooinga
Trooper Dale	Roan	5	W. E. Sauer, Gayndah
Uncle	Brown	6	V. Osborne, Cobba-da-mana
Unnamed	Bay	5	—. Doran, Maryborough
Unnamed	Bay	Aged	—. Birch, Murgon
Unnamed	Bay	4	P. S. Connor, Stanwell
Unnamed	Bay	3	J. B. Pennell, Kalbar
Unnamed	Brown	5	G. Launder, Toogoolawah
Valley's Pride	Bay	5	J. Batley, Chariwood, *via* Kalbar
Wallace	Bay	6	C. Emery, Fairview, Bororen
Wallace Monk	Bay	Aged	H. J. Stokes, Thornton, Laidley
Warroo	Brown	5	G. F. Goodrich, Warroo, *via* Inglewood
Young Barron	Bay	4	W. C. Weeks, Boonnenne, Kingaroy
Young Jim II.	Bay	Aged	E. Anderson, Gympie
Young Rich and Rare	Bay	Aged	A. A. Watts, Yelarbon
Young Southgate Carbineer	Chestnut	Aged	R. Bishop, Moore
Ziff	Bay	Aged	J. W. Watson, Gympie

AGRICULTURE ON THE AIR.

Radio Lectures on Rural Subjects.

Arrangements have been completed with the Australian Broadcasting Commission for the regular delivery of further radio lectures from Station 4QG, Brisbane, by officers of the Department of Agriculture and Stock.

On Tuesdays and Thursdays of each week, as from the 3rd July, 1934, a fifteen minutes' talk, commencing at 7.15 p.m., will be given on subjects of especial interest to farmers.

Following is the list of lectures for July, August, and September, 1934:—

SCHEDULE OF LECTURES.

BY OFFICERS OF THE DEPARTMENT OF AGRICULTURE AND STOCK, RADIO STATION 4QG, BRISBANE (AUSTRALIAN BROADCASTING COMMISSION).

Tuesday, 3rd July, 1934—"Results of Disease Resistance Trials with Cane Varieties." By A. F. Bell, Sugar Pathologist.

Thursday, 5th July, 1934—"Intensive Cane Cultivation and Costs of Production." By Dr. H. W. Kerr, Director, Bureau of Sugar Experiment Stations.

Tuesday, 10th July, 1934—"Preparing Pigs for Show." By L. A. Downey, Instructor in Pig Raising.

Thursday, 12th July, 1934—"The Principles and Practice of Pig Feeding. By L. A. Downey, Instructor in Pig Raising.

Tuesday, 17th July, 1934—"Plants Poisonous to Stock." By C. T. White, Government Botanist.

Thursday, 19th July, 1934—"Plants Poisonous to Stock." By C. T. White, Government Botanist.

Tuesday, 24th July, 1934—"A Ramble in Rural England and its Lessons." By J. F. F. Reid, Editor of Publications.

Thursday, 26th July, 1934—"An Excursion to Scotland—Livestock Studies." By J. F. F. Reid, Editor of Publications.

Tuesday, 31st July, 1934—"Queensland—A Fruitful Country." By J. F. F. Reid, Editor of Publications.

Thursday, 2nd August, 1934—"The Story of Butter and Cheese throughout the Ages." By O. St. J. Kent, B.Sc., Analyst.

Tuesday, 7th August, 1934—"The Packing and Preparation of Tomatoes for Market." By J. H. Gregory, Packing Instructor.

Thursday, 9th August, 1934—"The Avocado in Queensland and Elsewhere." By H. Barnes, Director of Fruit Culture.

Tuesday, 14th August, 1934—"Packing Shed Hygiene." By J. H. Gregory, Packing Instructor.

Thursday, 16th August, 1934—"The Importance of Citrus Bud Selection." By H. Barnes, Director of Fruit Culture.

Tuesday, 21st August, 1934—"Papaw Cultivation." By H. Barnes, Director of Fruit Culture.

Thursday, 23rd August, 1934—"The Pasteurisation of Milk and its Products." By O. St. J. Kent, B.Sc., Analyst.

Tuesday, 28th August, 1934—"Vitamins in Dairy Products." By O. St. J. Kent, B.Sc., Analyst.

Thursday, 30th August, 1934—"Factors Influencing the Amount of Fat in Milk." By O. St. J. Kent, B.Sc., Analyst.

Tuesday, 4th September, 1934—"Seasonal Farm Crops," Part I. By C. J. McKeon, Instructor in Agriculture.

Thursday, 6th September, 1934—"Seasonal Farm Crops," Part II. By C. J. McKeon, Instructor in Agriculture.

Tuesday, 11th September, 1934—"Seasonal Farm Crops," Part III. By C. J. McKeon, Instructor in Agriculture.

Thursday, 13th September, 1934—"The Tobacco Industry Protection Act of 1933." By H. S. Hunter.

Tuesday, 18th September, 1934—"Some Requirements of Plant Growth." By E. H. Gurney, Agricultural Chemist.

Thursday, 20th September, 1934—"Fertilizers and Manures." By E. H. Gurney, Agricultural Chemist.

Tuesday, 25th September, 1934—"Nutritive Value of Pasture." By E. H. Gurney, Agricultural Chemist.

Thursday, 27th September, 1934—"Mineral Ingredients in Stock Foods." By E. H. Gurney, Agricultural Chemist.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of the Australian Illawarra Shorthorn Society and the Jersey Cattle Society, production charts for which were compiled during the month of April, 1934 (273 days period unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
Mature Cow (over 5 Years), Standard 350 Lb.				
Kilbirnie Ethel 3rd	Macfarlane Bros., Radford	15,733·05	715·677	Mowbray of Darbalara
Diana 17th of Kelston	A. Frank, Boonah	15,950·2	687·803	First Warrior of the Cedars
Kilbirnie Viola 1st	Macfarlane Bros., Radford	13,252·4	561·656	Mowbray of Darbalara
Nancy 6th of the Retreat	D. Gierke and Sons, Helidon	12,741·17	557·457	Togo of Whiteoak
Rowdy III. (268 days)	G. Gwynne, Umbiram	11,088·6	484·87	Exchange of Balmoral
Trevor Hill Blossom	G. Gwynne, Umbiram	8,486·91	395·383	Prince of Braemar
Daisy II. of Trevor Hill	C. O'Sullivan, Greenmount	9,334·37	376·036	Prince of Braemar
Senior, 4 Years (over 4½ Years), Standard 330 Lb.				
Fancy 4th of Blacklands (270 days)	A. M. Johnson, Gracemere	8,617·94	361·143	Governor of Blacklands
Phyllis 4th of Springdale	D. Gierke and Sons, Helidon	10,810·06	361 83	Lovely's Commodore of Burradale
Junior, 4 Years (under 4½ Years), Standard 310 Lb.				
Trevor Hill Princess 2nd	G. Gwynne, Umbiram	11,614·8	449·270	Prince of Braemar
Miss Royal 2nd of Blacklands (268 days)	A. M. Johnson, Gracemere	8,502·05	369·305	Governor of Blacklands
Handsome 13th of Rosenthal	S. Mitchell, Warwick	8,369·5	316·304	Dividend
Senior, 3 Years (over 3½ Years), Standard 290 Lb.				
Lovely of Trevor Hill	G. Gwynne, Umbiram	9,122·5	406·886	Illawarra II. of Mayfield
Ethel 5th of Kilbirnie	Macfarlane Bros., Radford	8,814·7	378·775	Mowbray 2nd of Kilbirnie
Jean 12th of Blacklands	A. Pickels, Wondai	8,000·3	327·301	Fussy's Monarch of Hillview

JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.				
Kingsdale Tot 4th	A. A. King, Mooloolah	7,995·7	370·044	Diamond Boy of Burradale
Rose 7th of Oakvilla	H. Marquardt, Wondai	9,937·23	365·687	Champion's Monarch of Oakvilla
Charm II. of Brundah	J. A. Heading, Cloyna	9,737·83	341·332	Osiris of Greyleigh
Penrhos Jess	A. Sandilands, Wildash	6,310·0	290·209	Bonnie Charmer of Coral Brae
SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.				
College Stately	Queensland Agricultural High School and College, Gatton	8,908·01	435·766	Premier of Hillview
Kilbirnie Bella 16th	Macfarlane Bros., Radford	8,482·5	367·501	Kilbirnie Kenilworth
Woodlyn Midget Mavis (269 days)	J. L. Lyndon, Worongary	8,851·6	355·315	Spanker of Glenrock
Lady May 2nd of Blacklands (266 days)	A. M. Johnson, Gracemere	9,619·02	333·671	Hugo of Blacklands
JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Rosenthal Trixie 15th	F. G. Lamkin, Kaimkillenbun	9,056·97	371·917	Rosenthal Handsome's Boy
College Granny 3rd	Queensland Agricultural High School and College, Gatton	8,164·68	346·273	Fussy's Kitchener
JERSEY.				
MATURE COW (OVER 5 YEARS), STANDARD 350 LB.				
Pineview Jewel	J. Hunter and Sons, Borallon	8,403·81	549·913	Oxford Buttercup Noble
Kelvinside Lady Marguerite	J. R. Williams, Glencliff	7,903 2	379·704	Noble Clarence of Kelvinside
Trinity Lady Clare (272 days)	J. Sinnamon, Moggill	7,358·19	369·683	Trinity Governor
SENIOR, 4 YEARS (OVER 4½ YEARS), STANDARD 330 LB.				
Ruth of Ipsley	J. A. Rudd, Yeerongpilly	7,358·75	430·916	Rheubin of Ipsley
SENIOR, 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.				
Trecarne Rosella 4th	T. A. Petherick, Lockyer	9,628·06	568·249	Trinity Officer
Lottie of Calton	J. Collins, Tingoora	11,195·33	540·48	Prince Clair of Calton
JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.				
Oxford Sister	M. J. Dunn, Laidley	6,386·23	310·891	Oxford Silvius
Glenmah Victor's Edna	F. A. Maher, Moggill	5,705·05	306·705	Retford Victor's Noble
Oxford Silver	M. J. Dunn, Laidley	4,851·75	270·061	Oxford Silvius
JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Oxford Joyful Maid	E. Burton and Sons, Wanora	7,282·98	433·938	Trinity Ambassador
Moya's Pride of Newhills	J. Nicol Robinson, Maleny	5,636·65	352·447	President of Brooklodge
Trinity Cremorne	J. Sinnamon, Moggill	4,348·22	241·669	Trinity Cromwell

Answers to Correspondents.

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. Cyril T. White, F.L.S.

Rattlepod. *(Crotalaria acicularis)* **Glycine Pea. Tick Trefoil.**

J.W.H. (Caboolture)—

We can find no records of the properties of *Crotalaria acicularis*. It is a common weed in the Philippines and the East Indies, but in these countries stock do not play an important part and records of plants poisonous to them are few and far between. However, several species of *Crotalaria* have been definitely proved by feeding tests, both in Australia and abroad, to be poisonous to stock, and under the circumstances it is as well to regard the plant with suspicion and to prefer its room to its company. In the East several species of *Crotalaria* are grown as green manure, and they are excellent for the purpose. Most of them are more poisonous in seed than at any other time, so if the plant is in cultivation, and it is at all practicable, at the present time it would be a good idea to plough it in.

The creeping or twining legume is *Glycine tabacina*. This is a very common legume in the average native mixed pasture in coastal Queensland, and should be quite an important constituent. We have not heard a common name applied to it, and generally simply refer to it as the Glycine Pea.

The more bushy, upright plant is *Desmodium polycarpum*, a species of Tick Trefoil. Like most of the genus it should be quite good fodder, especially in rather wet, low-lying situations where this particular species is often found. The genus is a very large one, some of the members being small creeping plants, others of a more upright shrubby growth as in the present case. The name Tick Trefoil arises from the fact that the pods break up into a number of pieces, each bearing a number of seeds. These attach themselves to the clothing, the hairs of animals, &c., and in this way the plant is spread from one place to another.

Galvanised Burr.

INQUIRER (Brisbane)—

So far as we have observed the Galvanised Burr starts seeding at a very early age and when only a few inches high. It is rather hard to tell when the seed is ripe, but generally speaking it is ripe when the spiny burrs are fairly hard. If the seed germinates with the spring rains somewhere about September, the seed is probably ripe towards the end of November or early part of December. About January the plant is one mass of ripe seeds and continues in this state right through the winter until the following spring. Regarding the grub that is eating the burr, we advise your sending a sample of it to Mr. R. Veitch, Chief Entomologist, Department of Agriculture and Stock, Brisbane. As you may have seen by the papers, the Minister for Agriculture and Stock, the Hon. Frank W. Bulcock, is very keenly interested in pests of Galvanised Burr and some other weeds.

Rattlepod; Cluster Clover.

R.H. (Pomona)—

(1) With the yellow flower—*Crotalaria incana*, a species of Rattlepod. The Crotalarias or Rattlepods are dangerous plants, and several of them both in Australia and abroad have been proved poisonous to stock. No feeding tests have been carried out with the particular one you send, but so far as we have observed stock rather avoid it. It is sometimes called Native Lucerne, but this name it not to be encouraged as it more correctly belongs to other plants which are quite good fodders.

(2) With small clusters of dark-pink flowers—*Trifolium glomeratum*, the Cluster Clover, an animal clover that comes up mostly in the autumn months, lasts through the winter, and dies out on the approach of the warm weather. Your specimen is rather unseasonable. It is quite a good fodder and is occasionally sown, though most frequently it comes up of its own accord on the edges of cultivations and similar places.

Bella Sombra Trees.

J.C.J.H. (Strathpine)—

The sample represents the Phytolacca or Bella Sombra tree (*Phytolacca dioica*), a very quick-growing tree. Sometimes it is planted for shade and green fodder for stock. Chemical analysis shows the leaves to have quite a high fodder value. In the days of ostrich farming in South Africa the tree was said to have been planted quite frequently as a fodder for ostriches. As regards the berries, we have seen fowls eat large quantities of them, particularly the dried ones under the trees, without any ill effects following. When the berries fall from the trees they are generally dried and shrivelled, and in such a form have rather a dry, sweetish taste something like currants or raisins.

Red Natal Grass.

J.S.P. (Nanango)—

The specimen is *Rhynchelytrum roseum*, Red Natal grass. This grass was imported into Queensland many years ago as a fodder, though its use in this respect seems to be quite limited. In Queensland it grows mostly along railway lines, in old cultivation lands, and is especially a weed of orchards in the coastal parts of the State. In such places it is used to a fair extent as a chop-chop for working horses, and farmers say it is quite good in this respect, especially if mixed with a little more palatable fodder.

Poison Peach.

N.I. (Collinsville)—

The particular specimen forwarded is the common so-called poison peach of Queensland and New South Wales (*Trema aspera*). The poisonous principle in this plant is a prussic-acid yielding glucoside somewhat similar to that found in Sorghum, occasionally in Sudan grass and other fodders. The occurrence of the glucoside in the plant is very transitory and what controls its formation is not known. It is certainly more often absent than present, and this accounts for the fact that stock frequently feed on Peach bush in very large quantities without any ill effects following whatever. We carried out some tests with this plant some years ago, and found that the poisonous principle was not confined to any one month. We got most positive results in February, but got positives again in May and June, but none in January and March. In June, as well as positive tests we got negative ones.

In reply to the query raised, although we do not known what controls the glucoside in this plant, it is more likely to be present in the young than in the old, and is most likely to be abundant if a cold snap quickly follows rank growing summer weather. Certainly the symptoms as described —a very rapid death and animals dying after drinking—seem to point to prussic-acid poisoning. As to the point raised as to why young stock should be effected more than old, we think young stock would certainly be more susceptible to the poisonous property of a plant of this type than older animals.

Tie Bush.

A.W.M. (Mount Nebo)—

Wickstroemia indica, Tie Bush, so called on account of the strong fibre contained in the bark. This plant has commonly been suspected of poisoning stock. Some few years ago leaves of it were fed to heifers at the Animal Health Station, Yeerongpilly. After about a fortnight's feeding the animals became very thin and emaciated and blood was passed with the dung, but on being put on to ordinary feed they recovered. About a year ago the berries were suspected of poisoning a child at Nambour. They were fed to guinea pigs and death resulted. On this account we think the plant should be destroyed.

Flannel Weed.

F.O'B. (Pullen Vale)—

The specimen is the Flannel Weed, *Sida cordifolia*, a very common weed in Northern Queensland. Of recent years it has spread to the more southern parts of the State. We do not think it has any fodder value, although it is not known to be poisonous or harmful in any way.

"Feather-top Rhodes Grass" (*Chloris Virgata*).

T.D. (Rywung)—

The specimen is *Chloris virgata*, commonly called the Feather-top Rhodes Grass. On the whole, so far as our experience goes, stock do not take to this plant although it has a green and luscious appearance. We have heard, however, that stock will eat it readily enough made into a form of hay, but on this point we have had no personal experience. The plant becomes a bad pest in cultivation, and has considerably decreased the yield of many of the lucerne fields in the Lockyer Valley. Where ordinary Rhodes Grass will generally thrive, we think its room is preferable to its company.

Native Trees Suitable for Park or Street.

A.H.B. (Nambour)—

"Australian Rain Forest Trees" may be obtained from Barker's Book Stores or any other Australian bookseller, and is published by the Council for Scientific and Industrial Research. Copies may be obtained direct from the local secretary, Council for Scientific and Industrial Research, corner Ann and Edward streets, Brisbane. The price is 10s.

Below is a list of native trees suitable for street and park planting. The list is, of course, by no manner of means complete, and is confined to trees that can be obtained either through the ordinary commercial channels or from Government and municipal nurseries, such as the Forestry Department or the Brisbane Botanic Gardens. If you visited the local scrubs you would find a number of seedlings of different trees that could be transplanted; or, failing seedlings, you could often get from the ground a number of seeds. These could be sown and afterwards pricked off into tubes or pots. I do not think you would find many unsuitable plants, because such a large number of the scrub trees make beautiful shapely specimens when grown in the open. Pittosporum (*Pittosporum undulatum*); Red Cedar (*Cedrela australis*)—Rather hard to grow on account of attacks of Cedar Twig Borer; White Cedar (*Melia dubia*)—Grown extensively, but berries are poisonous; Crow's Ash (*Flindersia australis*)—One of the handsomest of out native shade trees; Yellow Wood (*Flindersia Oxleyana*); Moreton Bay Chestnut or Bean Tree (*Castanospermum australe*)—Much grown as a street and park tree, but seeds are poisonous to live stock; Citron Scented Gum (*Eucalyptus citriodora*); Buckinghamia (*Buckinghamia celsissima*)—A native of North Queensland. There are some beautiful specimens in Queensland streets; Queensland Nut (*Macadamia ternifolia*); Flame Tree (*Sterculia acerifolia*); Wheel of Fire (*Stenocarpus sinuatus*)—A beautiful tree, but very slow grower; Queensland Beech (*Gmelina Leichhardtii*); Kauri Pine (*Agathis robusta*); Hoop Pine (*Araucaria Cunninghamii*); Cypress Pine (*Callitris columellaris*), or other species; Figs (*Ficus* sp.)—Some of the smaller leaved sorts are excellent, though their extensive root system is a drawback; Silky Oak (*Grevillea robusta*).

Guinea Grass—Suspected Poisoning.

F.T. (Charters Towers)—

The sudden death of the calves and the thorough-bred colt point rather to prussic-acid poisoning, and it seems possible that the Guinea grass has suddenly developed this poisonous property. Send some of your local Guinea grass to the Commonwealth Stock Experiment Station, Townsville, and ask if their chemist could make a test for the presence of a prussic-acid yielding glucoside. We recommend this course because it is preferable to test this grass when fresh, and by the time the specimen reached Brisbane it would either have become very dry or very mouldy. In either case, it would not be very satisfactory for examination for the presence of a prussic-acid yielding glucoside. At the same time we are getting samples of Guinea grass from a number of different localities around Brisbane for a similar examination. The matter brought up by you, needless to say, is a very important one, because Guinea grass is one of the commonest grasses in Queensland and is again coming very much into favour. Personally, we may say that so far as our experience goes stock are extremely fond of Guinea grass, and although we have seen much of it fed have never heard of any trouble before. If we cannot find a poisonous principle in the Guinea grass, the cause of the trouble must be looked for elsewhere.

PLATE 169.—OFFICE BEARERS AND MEMBERS OF DEPARTMENT OF AGRICULTURE AND STOCK CRICKET TEAMS.

First Grade (Runners Up) and 3C Grade (Premiers), Q.C.A. (Warehouse Division), 1933-34.

Back Row.—E. Keefer, S. S. Hooper, R. Short, J. P. Orr, H. Barnes.

Second Row.—S. Davis, E. Burns, F. Bell, A. Kerr, H. S. Hunter, M. Muller, C. N. Morgan, W. E. Hanley, R. Pritchard, J. C. Maunder.

Front Row.—E. Taylor, C. Peel, C. J. McKeon, S. Pegg, E. Graham, (Under Secretary), Hon. F. W. Bulcock, M.L.A. (Minister for Agriculture and Stock), R. Wilson (Assistant Under Secretary), R. Taylor, T. McKnight, W. Palmer, S. Burchill.

General Notes.

Staff Changes and Appointments.

Constable P. J. Purtill, of Yamba, has been appointed also an Inspector under the Slaughtering Act.

Mr. S. C. Knack, Broadmere, via Taroom, has been appointed an Honorary Inspector under and for the purposes of the Diseases in Stock Acts.

Mr. R. I. Robinson, care of Farleigh Mill, Farleigh, via Mackay, has been appointed millowners' representative on the Farleigh Local Sugar Cane Prices Board, in the place of Mr. T. G. Mulherin, who has resigned.

Mr. H. G. Mulherin, Cameron's Pocket, Calen, has been appointed to the position of canegrowers' representative on the Farleigh Local Sugar Cane Prices Board, which has been rendered vacant by the resignation of Mr. H. C. J. Hansen.

Mr. E. Richards, loader for the Committee of Direction of Fruit Marketing at Howard, has been appointed also an Honorary Inspector under the Diseases in Plants Acts.

Mr. A. Popham, Flinders lane, Townsville, has been appointed an honorary ranger under the Animals and Birds Acts.

Mr. E. H. H. George, Assistant Inspecting Check Chemist and Assistant Statistical Officer, Central Sugar Cane Prices Board, has been appointed Assistant Secretary to the Central Board.

The following Cane Testers have been appointed for the forthcoming sugar season:—P. H. Compton (Babinda Mill), Miss A. L. Levy (Bingera), T. D. Cullen (Cattle Creek), C. J. Boast (Fairymead), J. Macfie (Farleigh), T. Herbert (Gin Gin), T. Breen (Inkerman), Miss J. Orr (Invicta), L. G. F. Helbach (Isis), Miss J. O'Flynn (Kalamia), Miss D. Marles (Maryborough), Miss M. T. Smith (Millaquin), L. C. Home (Moreton), F. W. Trulson (Mossman), L. Chadwick (Mount Bauple), C. H. Jorgensen (Mourilyan), V. F. Worthington (Mulgrave), Miss I. Palmer (Pioneer), J. C. D. Casey (Plane Creek), W. J. Richardson (Pleystowe), Miss E. Christsen (Proserpine), T. P. Brown (Qunaba), J. Howard (Rocky Point), G. Tait (South Johnstone), Miss A. Walsh (Tully), R. D. Woolcock (Marian), H. T. Whitcher (North Eton), T. F. Corbett (Racecourse).

The following Assistant Cane Testers for the forthcoming sugar season have been appointed:—Miss M. A. Lyle (Babinda Mill), Mrs. M. Nally (Bingera), Miss E. Rowe (Farleigh), Miss D. Bowder (Inkerman), Miss A. Anderson (Invicta), Miss D. Aldridge (Isis), H. McAntee (Kalamia), Miss M. E. L. Wassell (Marian), D. Walton (Marian), Miss F. Foubister (Maryborough), Miss M. Thorburn (Millaquin), Miss N. Hooper (Moreton), Miss S. Wilkinson (Moreton), Miss M. Morris (Pioneer), St. C. G. Fanning (Plane Creek), Miss E. Crees (Plane Creek), Miss P. Southwick (Pleystowe), H. A. Larsen (Pleystowe), Miss T. Payne (Proserpine), Miss C. Humphreys (North Eton), C. H. Humphreys (Racecourse), Miss M. Orr (Racecourse), S. McRostie (South Johnstone), Miss A. Murray (Tully).

Mr. K. S. McIntosh (B.V.Sc. Sydney University), Lismore, has been appointed Government Veterinary Surgeon, Department of Agriculture and Stock. Mr. McIntosh will be attached to the Animal Health Station, Yeerongpilly.

Mr. A. A. Armitage and V. H. Stringer, of Bundaberg, have been appointed Honorary Rangers under the Animals and Birds Acts.

Messrs. W. L. Sanderson, J. Logan, and P. J. Brereton, members of the Eumundi Fruitgrowers' Association, Limited, have been appointed Honorary Inspectors under the Diseases in Plants Acts.

Mr. W. C. Burrowes, Clerk of Petty Sessions, Maryborough, has been appointed an Agent of the Central Sugar Cane Prices Board for the purpose of making inquiries in pursuance of the provisions of the Regulation of Sugar Cane Prices Acts regarding sales and leases of assigned lands in the Maryborough district.

Mr. C. G. Revitt, Dunk Island, has been appointed an Honorary Ranger under the Native Plants Protection Act.

New Boundaries of the Helidon and South Burnett Cleansing Areas.

An Order in Council has been issued under the Diseases in Stock Acts amending the existing boundaries of the Helidon and South Burnett cleansing areas. In the case of the South Burnett area, a portion of the Auburn-Chinchilla area has been included within its boundaries, together with a certain area of land lying between the two areas. The Helidon cleansing area will now include the Crow's Nest cleansing area.

Hail Insurance.

Regulations have been issued under the Primary Producers' Organisation and Marketing Acts adding to the Canary Seed Board Hail Insurance regulations which were issued in September, 1931. These empower the Canary Seed Board to establish a Hail insurance fund for the purpose of paying to canary seed growers compensation in respect of crop losses through hailstorm damage. The fund is created by a levy in the form of a pro rata premium charge against all growers calculated on the basis of the quantity of canary seed harvested and that on which hail compensation is payable each year, and is known as the Canary Seed Board Hail Insurance Compensation Fund. The levy is a charge against the grower, and may be a deduction from advances, but the sum chargeable in any one year shall not exceed 7½ per cent. of the total value of the canary seed insured during the same year.

All canary seed is automatically covered from the time it is fully out in ear until it is harvested, but such cover shall not extend beyond the 31st January in any year. Particulars in regard to claims for compensation and for the payment thereof are also contained in these regulations.

The regulations issued provide that crops shall not be entitled to compensation unless the same are totally destroyed, or if such crops are partially destroyed, unless they are actually harvested and the resultant grain is delivered to the Board. No crop shall be assessed in excess of 560 lb. of canary seed per acre. Further, no compensation shall be payable in respect of destruction of or damage to any crop, unless a return in the form provided has been lodged with the Board on or before the 30th September in each year. The return sets out the area planted, the area to be harvested, and other information. In any case where the Board is of opinion that good reason exists for the failure of any person to furnish a return, it will pay compensation under these regulations, notwithstanding such failure to furnish the return.

Plywood and Veneer Board.

Notice of intention to constitute a Plywood and Veneer Board was issued on the 22nd March last, and a petition invited on the question of the setting up or otherwise of such a Board, which was to be lodged by the 23rd April, 1934.

No petition was received, and Executive approval has been given to the issue of an Order in Council formally constituting a Plywood and Veneer Board for a term of one year as from the date of the Order. The Order provides for the declaration of all plywood and veneer produced in that portion of the State south of the twenty-third degree of south latitude to be commodities under the Primary Producers' Organisation and Marketing Acts, and for the constitution of a board in relation thereto. The board shall be a marketing board, consisting of ten elected representatives of the growers together with the Director of Marketing, or a deputy appointed by the Minister, and an officer of the Forestry Department. The members, except the Director of Marketing or his deputy, and the Forestry officer, shall be elected annually.

The commodities shall be vested in the Board as the owners thereof. The Board shall have authority to acquire and allocate raw material (including timber) required by producers, and shall receive and allocate to the producers, on a quota basis, as decided by the Board, all orders for the supply of plywood and veneer, and shall control the marketing thereof. The Board shall also control the appointment of agents in Queensland, the Commonwealth, and in other countries, and shall determine the remuneration of such agents.

The following have been appointed members of the Plywood and Veneer Board for the period from 3rd May, 1934, until 2nd May, 1935:—

Messrs. R. H. Bentley (Austral Plywood Pty., Ltd.), J. F. Brett (Brisbane Sawmills Pty., Ltd.), G. Brown (Brown and Broad Newstead Homes Ltd.), J. E. Christoe (Manumbar Timber Co. Pty. Ltd.), J. W. Jackson (Newmarket Plywood Co., Ltd.), W. L. Johnson (Newmarket Plywood Co., Ltd.), G. W. Nutting (Stanoply Timber Co. Pty., Ltd.), C. R. Paterson (Hancock and Gore, Ltd.), P. S. Reid (National Plywood Co. Pty., Ltd.), R. J. Donaldson (The Oxley Plywood Co. Pty., Ltd.), A. E. Gibson (Deputy for the Director of Marketing), and G. A. Duffy (Chairman, Timber Advisory Committee, Forestry Sub-Department).

Island Sanctuaries for Birds.

Holbourne Island, about 18 miles north of Cape Edgecombe, and Arkhurst, Langford, Black, and Bird Islands, situated about 30 miles north-easterly from Proserpine, have been declared sanctuaries under the Animals and Birds Acts.

Sugar-cane Assessment.

An Order in Council has been issued under the Regulation of Sugar Cane Prices Acts fixing the assessment on all sugar-cane received at mills on and after the date of this Order to be at the rate of 1¼d. per ton. This rate is similar to that of last year.

Butter Board.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts giving notice of intention to extend the operations of the Butter Board from 1st July, 1934, to the 7th February, 1935. A petition for a poll on the question of whether or not the Board should be extended for such term may be lodged by at least 10 per cent. of the growers on or before the 19th June.

Dairy Products Stabilisation Act.

Provision is made in the Dairy Products Stabilisation Act, which was passed last session, that where, after the passing of the Act, any circumstances arise whereby it shall appear to the Governor in Council (for the purpose of giving full effect to the objects and purposes of the Act, or for the proper stabilisation of dairy products) that any amendment of the Act shall be deemed desirable, such amendment may be made by Order in Council.

An Order in Council has been issued, amending, in certain particulars, the abovementioned Act. The amendments include the insertion in the Act of definitions for the words "process," "processing," and "cheese." A new definition of "dairy product" is inserted, and the definition of "quota" is amended.

Section 9 of the Act, which empowers the Dairy Products Stabilisation Board to promulgate a quota, which should be based on the quota determined by the Minister for Commerce, has been deleted, and a new section inserted in its place. This omits the reference to the necessity for basing the quota on that determined by the Minister for Commerce.

Minor amendments are made in section 10.

A new section (19A) provides that for the better enforcement of the Act, and in addition to any other provision in the Act in that behalf contained, the Supreme Court may, on the application of the Board, make any such order as it deems just and necessary in the nature of a mandamus or injunction to compel compliance with or restrain a breach or continuance of a breach of any of the provisions of the Act or Order in Council thereunder or of any lawful determination of the Board, and all necessary powers, authorities, and jurisdiction of the Supreme Court shall apply and extend herein and are vested in the Supreme Court accordingly.

Egg Board.

A regulation has been issued under the Primary Producers' Organisation and Marketing Acts, extending the Egg Board Levy Regulations for the period from 1st January, 1934, to 31st December, 1938. These regulations were issued in April, 1929, and extended until 31st December last, and empowered the Egg Board to make a levy at the rate of ½d. per dozen on all eggs delivered to the Board. The sums raised by the levy are used for administrative purposes of the Board.

Dairy Product Manufacturer Defined.

"The Dairy Products Stabilisation Act of 1933" provides that a "manufacturer" shall mean a person who manufactures in the State such weight of dairy products for sale as may from time to time be prescribed by Order in Council in any period prescribed by Order in Council. An Order in Council has been issued under the Dairy Products Stabilisation Act prescribing that the weight of dairy products aforesaid shall be ten pounds and that the period shall be one week. Accordingly, a manufacturer of dairy products shall manufacture within the State ten pounds of dairy products for sale in any one week.

Milk and Cream Testing Examination.

An examination of Certificates of Proficiency under "*The Dairy Produce Acts, 1920 to 1932*" in the subjects of milk and cream testing, milk grading, cream grading, butter making and cheese making, will be held on Saturday, 28th July, 1934, in centres that will, as far as possible be arranged to suit candidates, who should notify the undersigned not later than the 12th July. Entrance fee 5s. for each subject should accompany the application, with an additional 10s. 6d. if a special centre is desired. Candidates must not less less than eighteen years of age on the day of examination.

Rural Topics.

The Gestation Period of Brood Sows.

Data obtained locally and from various parts of the world prove the normal gestation period of the breeding sow—that is, the time that elapses between date of successful service and actual date of birth of the litter is 112 days—sometimes spoken of as three months, three weeks, and three days. It is frequently noticed that pigs that are carried over the normal gestation period have sharp baby milk teeth when born, which they use, in spite of the teats and udders of the sow causing her restless and inducing her to refuse to allow her young to suckle. It sometimes happens that the sow suffers pain past the usual period and will turn round suddenly and may bite the young pigs, sometimes breaking their necks and limbs and causing much injury. Much of it is difficult to overcome. To prevent undue pain and distress to the sow and to protect the young pigs against the sharp baby teeth, these should be cut off with a pair of nail nippers when the pigs are a few days old. If they are left untouched it is possible that the sow may refuse to suckle her litter at all, and there may be fever and inflammation of the teats and udders of the sow follows. Removal of the tusks of older pigs is also advised, though it is a much more difficult operation and can only successfully be carried out by an experienced hand.—E. J. SHARMAN, H.D.A.

To Prevent Over-cropping in the Orchard.

Because of the light crop in many orchards this season, the trees will probably show an abundance of blossom buds in the coming spring, and if over-cropping is allowed to occur the fruit the next season will be small and of poor quality, whilst the reduced vitality of the trees will prevent a satisfactory crop the year following.

Whilst it may not be possible to prevent alternate cropping, it is possible, by means of pruning and judicious thinning of the sprays supplemented by hand thinning, if necessary, to prevent over-production of fruit, which not only reduces size and quality, but is one of the causes of alternate bearing of pome fruit.

The restraining effect of an abnormally heavy blossoming even when no fruit set was strikingly illustrated on several occasions recently with pear trees. Portions of the trees were heavily spur pruned, in some instances as much as 50 per cent. of the blossom buds being removed, and the trees so treated not only carried a good crop of fruit but also made a fair amount of new wood growth, whilst unpruned portions of the trees, though a mass of bloom, failed to set any fruit or to make any wood growth.—A. and P. Notes, N.S.W. Department of Agriculture.

Fistulous Withers.

An article on fistulous withers in horses in the current issue of the New South Wales *Agricultural Gazette* contains a point of very great interest to dairy farmers, namely, the relationship which exists between fistula of the withers of horses and *contagious abortion of cattle.*

In 1910 some German veterinarians reported that they had discovered a relationship between fistula of the withers in horses and contagious abortion in cattle. These workers discovered that the germs of contagious abortion of cattle were frequently present in the pus of horses affected with fistula. In 1922 the discovery was confirmed in France, and in 1925 similar confirmation came from America, and Holland. In 1931 veterinarians in Western Australia reported the first occurrence of the disease in that State, and in 1932 our own Veterinary Research Station at Cheltenham obtained similar results. Similar reports have also come from England and from Sweden.

It is now accepted throughout the world that there is a definite relationship between contagious abortion in cattle and fistula of the withers of horses. This fact is extremely important to all interested in horses, owners and in dairy farmers for the reason that horses suffering from fistula of the withers constitute a present source of danger to contract fistula of the withers. But most important of all, to the dairy farmer, is the fact that a horse may spread abortion of cattle. Horses suffering from fistula of the withers may spread abortion of cattle by infecting pastures, water troughs, etc., which may subsequently be visited by cattle and infect them with contagious abortion.

It is of some interest, too, that the large swellings known as bursomas, which occasionally occur on a cow's hock have frequently similar properties to the same germs, and thus have been found to participate in the spreading of the too prevalent germ.

Points in Lamb Marking.

The main consideration in lamb-marking, apart from the prevention of actual mortality, is the avoidance of any decided check in the growth of the lamb. Lambs should be marked as early as possible so long as they are healthy and active; if the operation is left too long there is more chance of a setback from loss of blood. The operation should be performed in the morning so that the lamb will have the bulk of the day in which to find its mother. If it is left until late in the day losses are likely to occur, especially if the night is cold.

The sheep should be mustered some time before the operations commence and the lambs allowed to settle down. There should be no rushing about, and dogs should be used as little as possible, as deaths from hemorrhage are very common when lambs are marked in an excited and overheated condition.

Cleanliness is vital in lamb-marking—heavy losses from various infections take place annually through sheepowners' failure to recognise this fact. The knife used for docking and tailing calls for special attention.

The most suitable type has the blade and handle all in one piece, but in any case it should be as plain and as sharp as possible, since germs may be harboured in' joints or corners and even in cracks in the blade or in slight irregularities in the cutting edge. Prior to the commencement of the operations the knife should be boiled, and it should be carried to the yards in the liquid in which it was boiled. Throughout the marking the knife should be dipped as frequently as possible in a carbolic solution or other disinfectant; and whenever it is out of the operator's hand it should be allowed to remain in the disinfectant.

Dirty yards are a breeding ground for various dangerous organisms, and the choice of the site for the operation is therefore important. It should be perfectly dry and well away from dust and dirt so as to minimise the risk of losses from lockjaw and blood-poisoning, and if the flock is not too large it is best to use temporary yards made of movable hurdles or wire-netting and stakes, in a fresh paddock each year. With large flocks this is perhaps impracticable, and the following treatment of the yards is recommended: Remove the surface soil of the yards to a depth of about 6 in., and place it in a heap, where it should be thoroughly mixed with quicklime; then saturate the fresh surface exposed with a strong solution of non-poisonous sheep dip.

In addition to the above precautionary measure it is essential to adopt some means of preventing the germs of disease from gaining entrance into the flesh-cuts made in the scrotum and tail. As the yards, although the main, are not the only source of infection, it is recommended that wounds of the scrotum and tail be either smeared with tar or dressed with carbolised oil (1 part of carbolic acid to 12 parts of oil) before the lamb is released after the operation. This is most important.

Lambs dead of tetanus or other of the inoculable diseases commonly contracted during marketing, if not destroyed, form fresh centres of infection by absorption of the micro-organism by the earth. All carcasses should therefore be destroyed by burning.

When marking lambs in temporary yards or in a corner of a paddock, care must be taken that the ewes are not allowed to spread too far in the paddock before the lambs are released. Although it is inadvisable to keep the ewes and marked lambs in a yard for any length of time after marking, a little shepherding of the flock in the paddock will repay the owner by ensuring that the lamb obtains a drink of milk as soon as possible after the operation. Very often it is found that a number of lambs which are possibly more seriously affected by the operation will hang about the gates of the yard, and if the ewes are not kept handy for at least a little while these lambs will probably become isolated and lost.—A. and P. Notes, New South Wales, Department of Agriculture.

Care of the Separator.

The operation of the separator and the care devoted to its cleansing have a material effect on the quality of cream produced. On no account should the separator be left overnight without being dismantled, and all parts thoroughly cleansed and scalded. After separating, all utensils and separator parts with which milk has come in contact, including the vats, buckets, and strainer, should be washed with slightly warmed water and then submerged in boiling water and placed on racks to drain. The practice of wiping over the utensils with a cloth after scalding only serves to undo the work of sterilisation and to re-infect with bacterial organisms.

Milk should not be left lying about on the floor or under the separator block, and the surroundings should be kept sweet and clean, and the drains free to carry away the floor washings.

Deodorising of Cream—Farmers' Responsibility.

Considerable interest is being shown in the installation of deodorisers at some of the New South Wales butter factories, but the belief current in some places that these machines will relieve the dairy farmer of the necessity for care in the production of cream should be most strongly discountenanced, observes the "Agricultural Gazette" of New South Wales.

Unfortunately, much cream used in the production of choicest butter has been below choicest quality, and farmers have been paid highest butter prices for cream which, if used alone in the production of butter, would not have produced this quality. It has only been made possible to pay these prices for "border-line" cream by the fact that the percentage of good cream has been considerably greater than that of inferior cream. When these two qualities have been mixed together, or blended, and subsequently neutralised and pasteurised, a bare choicest grade butter have been produced.

The supplier of the lower grade cream may thank his careful neighbour and the pasteuriser for his good luck in obtaining the best price. It is certainly not playing the game for the careless supplier to impose on his more careful neighbour, for that is what it really amounts to. If his example should be followed generally, it would not be long before the point was reached—and there are evidences of it to-day in some places—that the quantity of good cream may be insufficient to permit of satisfactory blending of the different qualities. Under such conditions the general quality of the butter will undoubtedly suffer.

With the advent of the process of deodorising cream there is an impression in some quarters that the farmer will be relieved of the need of any care, and for the future he will be able to rely upon the deodorising machine to remove any and all faults, whether they be due to his neglect or to his bad management. The deodoriser is a valuable machine and was primarily developed for the elimination of vegetable chemical contaminations, which it does thoroughly, but it should not be regarded as a means by which to abstract the taints produced by the presence of objectionable microorganisms which have developed in the cream as the result of insanitary conditions or careless methods of production.

Care and scrupulous cleanliness, together with control of cream temperature, are just as necessary to-day on the part of the dairy farmer as they have always been. He must not expect mechanical appliances in the factory to remove faults which he himself can prevent by the exercise of common cleanliness and common sense. Given this attention the pasteuriser and deodoriser will remove any feed taints and so improve his cream that the production of choicest quality butter is reasonably assured.

Work in the Citrus Orchard.

The low returns received by citrus growers during the past two seasons has forced upon them a realisation of the fact that the utmost economy must be practised in production methods. There is at least one direction in which improved production can be achieved without increasing expenditure, and that is by producing fruit of a better commercial size (write officers of the Fruit Branch of the New South Wales Department of Agriculture in current notes). In coastal areas too great a proportion of citrus fruits is on the small size. Satisfactory size in fruit is mainly dependent on sufficient soil moisture and a thrifty tree condition.

Increasing the soil's capacity to retain moisture in established groves is possible only by increasing the organic content of the soil. In soil so improved the trees are enabled to send their roots down to a deeper feeding zone. In this connection the value of green manure crops should not be overlooked.

In green manuring trials carried out over several years and in many different types of soils purple vetch has proved a vern consistent and heavy producer. During wet seasons on the coast it is much more reliable than field peas. A sowing of from 10 to 20 lb. purple vetch seed per acre is economical, especially if drilled in with 1 cwt. of superphosphate. Under inland conditions the tick bean is the most satisfactory green crop. Many orchardists rely on weed growth for the supply of organic matter, but this is not sufficient, as is evidenced by the fact that many trees growing under such conditions are difficult to maintain in a thrifty state.

Another factor that assists in the satisfactory development of citrus fruits is the maintenance of the leaf-bearing area of the trees. In this relation timeliness of spraying may have a not unimportant influence. When spraying operations are delayed, heavier applications than would otherwise be necessary have to be used. Particularly is this the case where white wax scale has to be combated, where if control measures are so delayed that it becomes necessary to use larger amounts of soda or to have recourse to the use of certain spray oils, defoliation in some degree may result.

PLATE 170.—DEPARTMENT OF AGRICULTURE AND STOCK CRICKET CLUB.
Premiers 3C Grade, Q.C.A. (Warehouse Division), 1933-34.
Front Row.—R. Wilson (Assistant Under Secretary, Department of Agriculture), E. Taylor, R. Taylor (Captain), J. P. Orr (Chairman, Sports Club), F. Bell (Vice-Captain), L. Smith, H. Hunter (Chairman, Cricket Club).
Second Row.—W. E. Hamley (Hon. Secretary), A. C. Peel, R. Pritchard, D. S. Davis, T. McKnight, L. Burgess.
Back Row.—H. Gardam, E. Burns. Inset.—W. Palmer.

Feed Economy of Food Production.

One of our subscribers recently came to us with a question concerning the efficiency of farm animals in converting feed into human food.

Jordan has summarised the data bearing on this subject in his book, "The Feeding of Animals." After having studied the data available, and by using comparable methods of comparison, he presents the following data as indicating the relative efficiency of farm animals in converting a given amount of feed into human food:

PRODUCED BY 100 LB. OF DIGESTIBLE ORGANIC MATTER IN RATION.

Animal.	Marketable Product.	Edible Solids.
	Lb.	Lb.
Cow (milk)	139·0	18·0
Pig (dressed)	25·0	15·6
Cow (green cheese)	14·8	9·4
Calf (dressed)	36·5	8·1
Cow (butter)	6·4	5·4
Poultry (eggs)	19·6	5·1
Poultry (dressed)	15·6	4·2
Lamb (dressed)	9·6	3·2
Steer (dressed)	8·3	2·8
Sheep (dressed)	7·0	2·6

To dairy farmers the most noticeable fact brought out by this comparison is the position of the dairy cow in respect to feed economy of food production. Out of ten live stock food products the dairy cow with her milk, green cheese, dressed calf, and butter occupies the first, third, fourth, and fifth positions.

When it comes to producing edible solids in the form of meat, swine are far more efficient than other farm animals, being a close competitor even to the dairy cow if compared with milk. It is interesting to note that the growth of a pound of edible beef solids requires a feed expenditure of nearly seven times as great as is necessary for the elaboration of a pound of milk solids.

Thus it may be stated that the dairy cow is not only the most efficient producer of human food but also she produces the most nearly perfect food. These facts should be kept well in mind by dairy farmers.—"Hoard's Dairyman."

Points for the Sheep Man.

Whether he is producing fine, medium, or strong wool, it should be the aim of the breeder to see that it has pronounced quality for its type, points out an officer of the Sheep and Wool Branch of the New South Wales Department of Agriculture in the "Agricultural Gazette." In order to produce such wool, and a good type of flock sheep, it is essential that graziers give strict attention to details when breeding. The main requirements are summarised in the following advice:—

Do not be dictated to by fashion; breed the type of sheep that is suitable to your district.

Do not mate extremes.

Do not try to achieve in one year that which normally takes three or four years of careful selection and breeding.

Select good sires. Make certain that the sire is good on the points and underneath; too many rams are bred which are weak in these respects.

Remember that in the case of many small flocks one of the main faults is lack of density, indicated by spindly wool on shoulder and point. Therefore, good rams showing a fair amount of development are needed.

Cull fairly heavily in order to produce a wool displaying all-round quality.

Do not pamper your sheep and deceive yourself.

Do not judge a stud by its stud sheep, but rather by its flock sheep.

The Home and the Garden.

OUR BABIES.

(Issued by the Queensland Baby Clinics.)

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

OUR INVISIBLE ENEMIES.

OUR worst enemies are those we cannot see. Some we cannot see even with the microscope. Yet science has learnt much, and we are by no means defenceless. It is not many years since infectious diarrhœas were the principal cause of an enormous infant mortality. The ways in which these germs got into infants' food were discovered, and by simple precautions, of which natural feeding is the most important, the mortality from this cause has been reduced to a very low figure. More infants die now from bronchitis and pneumonia than from diarrhœa. Very little, almost nothing, is being done to prevent these deaths.

The Common Cold.

In children bronchitis and pneumonia nearly always follow some other infection, of which the most frequent is the "common cold." All three are caused by disease germs, but the germ of a "cold" is the pioneer that clears the road. Every winter this germ is specially active.

How It Spreads.

Some people are afraid of catching "colds" from exposure to the weather. They are deluded. "Colds" are rarely caught out of doors. We get them by sitting in closed rooms with other people who are carrying the germs in their air passages. Whenever they cough, a fine, invisible spray floats around them and we inhale it. The more people there are in the room the greater is the risk. "Colds" may be spread among children by kissing and fondling, and by the child who puts his fingers in his mouth and smears them on his playfellow's face. It is easy to understand why "colds" are more frequent in winter.

How to Prevent Infection.

None of us can avoid these germs altogether, but we can avoid taking an overdose of them. The healthy body has powers of resistance, but only to a limited extent. A few germs are easily destroyed and may even increase our resistance, but a massive infection overcomes it.

Therefore, those who suffer from a "cold," if they cannot keep at home should keep their distance, and smother their coughs in their handkerchiefs. Babies and young children should be kept away from crowded rooms and halls. Children should be taught very early to keep their fingers out of their mouths. How little do we practise these simple precautions! We have known infants to be passed round large family gatherings like a church plate to collect not threepenny-bits but the pooled germs of the whole assembly!

How to Increase Resistance.

We must not only avoid massive infections, we must raise our children's resistance to the highest point. We must do this early, and not wait till they suffer from chronic catarrhs, diseased tonsils, and adenoids. Resistance is increased by healthy living—that is by plenty of fresh air and sunshine, open windows, sensible clothing (not over-clothing), and especially by good food. In particular give the child plenty of milk, a fair allowance of butter, green vegetables, some uncooked fruit, whole wheat or a daily spoonful of cooking bran (after two years of age). If he is not very strong give him cod liver oil or some substitute rich in vitamin.

Sweetmeats Lessen Resistance.

We all know how 'colds'' spread through the schools. A careful observer in Scotland noted that during the war, when sugar was severely rationed and sweetmeats were unobtainable, cases of catarrh of more than seven days' duration in a large boarding-school for girls were reduced by two-thirds. Since then he has made further observations and found that the occurrence of catarrhs was roughly proportionate to the sugar intake. Among schoolgirls who averaged about 1 lb. of sugar a week the catarrhal rate was 5·5 per cent. Among those who averaged about 2 lb. the rate was 24·6 per cent., more than four times as great. Whether their resistance was lowered by too much sugar, or by the sugar spoiling their appetites for vitamin-containing foods, is uncertain, but in either case sugar had done harm.

IN THE FARM KITCHEN.

CURRY AND RICE.

Materials—1 lb. bladebone steak or 1½ lb. neck chops; 1 onion; 1 apple; 1 tablespoonful dripping; 1 dessertspoonful flour; 1 tablespoonful sultanas; ½ lemon; 1 tablespoonful curry powder; 3 gills water; 1 dessertspoonful vinegar.

Utensils—Knife; board; saucepan; fork; wooden spoon; dish; basin.

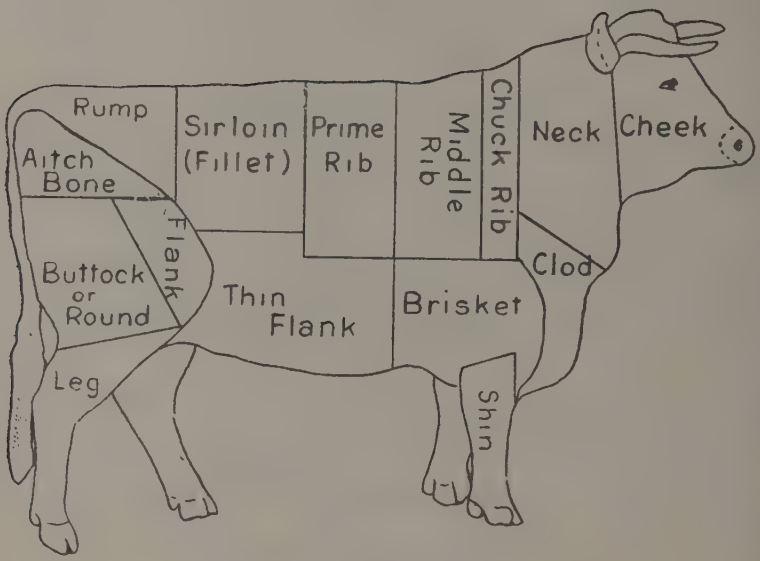
Method—

1. Cut up steak into strips or squares about ½ an inch thick; or trim chops, removing fat.
2. Peel and cut up the apple and onion; heat fat in a saucepan.
3. Add meat; fry it until both sides are brown; lift it out; put it on a plate.
4. Put into the hot fat the flour, apple, onion, sultanas, grated rind of lemon, and half the curry-powder.
5. Fry until all the ingredients are partly cooked; add water; bring to boiling point, stirring constantly.
6. Add meat; simmer for 1½ hours, taking care that the curry does not burn.
7. Add the remainder of the curry-powder, blended with vinegar; stir well; boil for 5 minutes.
8. Serve on a hot dish with a border of boiled rice round the curry.

Notes—

1. 1 tablespoonful of chutney may be used instead of the apple or sultanas.
2. Any kind of meat, poultry, or fish may be curried similarly; if cooked meat is used, a shorter time may be allowed for simmering.

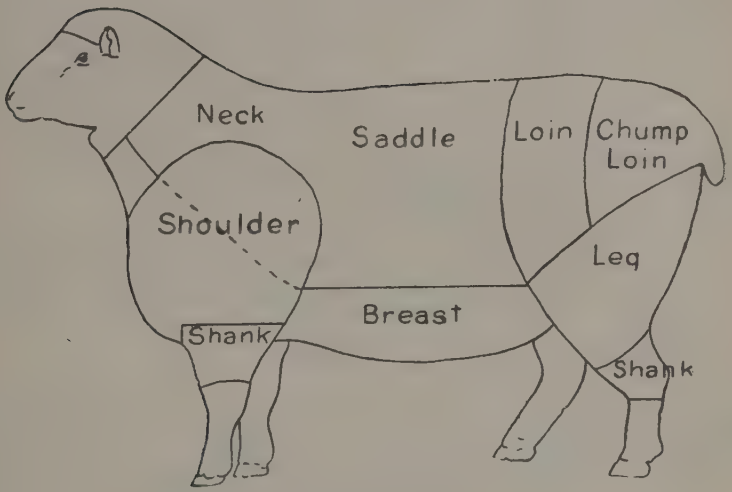
CUTS OF BEEF.



Methods of Cooking Beef.

Roasting or Baking.	Braising.	Boiling.	Stewing.	Frying or Broiling.	Salting or Spicing.	For Brawn.	For Soup.
Sirloin ..	Round ..	Flank	Clod ..	Rump	Chuck-rib	Leg ..	Round
Ribs ..	Aitchbone	Thin Flank	Flanks	Round	Round ..	Shin ..	Clod
Aitchbone	Flank ..	Brisket	..	Aitch-bone	Brisket	Cheek ..	Leg
Round ..	..	..	..	..	..	..	Bones
..	..	Round	Neck	Fillet..	Thin Flank	..	Flanks

CUTS OF MUTTON.



Methods of Cooking Mutton.

Roasting or Baking.	Braising.	Boiling.	Frying or Broiling.	Salting.	For Soup.
Leg ..	Neck ..	Leg ..	Leg chops ..	Leg ..	Bones
Shoulder	Chump loin	Neck ..	Loin chops ..	Breast ..	Shank
Loins ..	Shoulder ..	Breast ..	Neck chops ..		

Processes of Cooking and Preserving Meat.

Term.	Process.	Directions.
1. Baking or Roasting	1. Put dripping into baking dish; heat. 2. Roll meat in flour, pepper, and salt. 3. Place on trivet over hot dripping in baking dish. 4. Put into oven.	1. The oven must be very hot when the meat is put in. 2. After 10 minutes heat must be moderated. 3. Allow 15, 20, or 25 minutes for each lb. and 15, 20, or 25 minutes over. 4. Baste every half hour.
Braising ..	1. Place dripping and cut-up onions in saucepan. 2. Add meat rolled in flour, pepper, and salt. 3. Place over fire; brown slightly, pour off dripping; add water. 4. Cover saucepan and place on fire. 5. Add vegetables about ¾ hour before the meat is cooked; add salt to taste.	1. Only remove lid when necessary. 2. Take care that vegetables are not overcooked. 3. After 20 minutes heat must be moderated. 4. Allow 20 minutes for each lb. and 20 minutes over.
Broiling or Grilling	1. Trim meat or fish to the required thickness and shape. 2. Rub over the bars or wires of a gridiron with butter or dripping 3. Put meat on the gridiron. 4. Cook over a clear open fire, placing the meat as close to the fire as possible. 5. Sprinkle with salt and pepper and add small pieces of butter.	1. The fire must be hot and clear. 2. The meat must be turned often. 3. A double gridiron is best as juices escape if a fork is used to turn the meat. 4. Allow 5 to 10 minutes for cooking.
Boiling ..	1. Put fresh meat into boiling water. 2. Boil hard for 5 minutes. 3. Reduce heat of fire; add salt; remove scum; cover saucepan. 4. Simmer. N.B.—Put salt meat into cold water.	1. Water must be boiling. 2. Red meat must simmer 20 minutes for each lb. and 20 minutes over. 3. White meat and corned round must simmer 25 minutes for each lb. and 25 minutes over. 4. Corned brisket must simmer 30 minutes for each lb. and 30 minutes over.
Stewing ..	1. Fry cut up onions and vegetables in dripping in a saucepan; pour off dripping. 2. Remove fat from meat. 3. Cut meat into convenient pieces. 4. Put meat into saucepan with vegetables. 5. Add sufficient water to cover; simmer. 6. Before serving add pepper, salt, and blended flour.	1. The fire must be slow. 2. Stew must simmer for 2½ hours.

1. For baking beef and mutton allow 15 minutes for each lb. and 15 minutes over.
For baking veal and lamb allow 20 minutes for each lb. and 20 minutes over.
For baking pork allow 25 minutes for each lb. and 25 minutes over.

PROCESSES OF COOKING AND PRESERVING MEAT.—*continued.*

Term.	Process.	Directions.
Frying ..	1. Heat dripping to smoking point. 2. Roll meat in flour, pepper, and salt. 3. Put meat into smoking dripping over fire.	1. Dripping must be very hot and sufficient to cover meat. 2. Turn meat twice. 3. Allow 15 minutes for cooking.
Salting ..	1. Rub salt, brown sugar, and saltpetre into meat. 2. Place meat in a barrel or wooden tub. 3. Turn meat daily in its liquor.	1. One lb. salt to ½ lb. brown sugar and ½ oz. saltpetre. 2. Rubbing must be thorough. 3. A barrel or wooden tub is necessary.
Spicing ..	1. Rub into meat, salt, saltpetre, pepper, and pimento. 2. Place on large dish. 3. Rub and turn daily.	1. Half oz. saltpetre to 1 lb. salt. 2. Meat must be kept on a delf or enamel dish.
Brawn ..	1. Cut away meat from leg and shin. 2. Divide into convenient pieces. 3. Saw bones into small pieces. 4. Put meat and bones into a boiler. 5. Cover with cold water; boil; skim. 6. Add salt, pepper, and spices. 7. Turn out into large dish; remove bones; cut meat into small pieces. 8. Pour into dishes to set.	1. Cold water must be used. 2. Meat must simmer for 5 hours.
Soup ..	1. Break up bones and cut meat into small pieces. 2. Put into boiler; cover with cold water; add salt; allow to stand for 20 minutes. 3. Bring slowly to the boil; remove scum. 4. Add barley, rice, or macaroni and vegetables cut small. 5. Simmer for 3 hours; season with pepper and salt before serving.	1. Cold water must be used. 2. Bones must be broken up into small pieces. 3. Scum must be removed. 4. Soup must simmer for 3 hours. 5. Allow 2½ cups of water to 1 lb. of meat and bones.

BOILED RICE.

Materials—1 cup rice; 1 dessertspoonful salt; ½ teaspoonful lemon juice; 6 cups water.

Utensils—Saucepan; basin; strainer.

Method—

1. Put water on to boil in a large saucepan.
2. Wash rice in three waters; put it into the saucepan when the water is boiling.
3. Add salt and lemon juice; boil hard for 15 minutes.
4. Strain; return rice to saucepan to reheat and dry.

FLOWER GARDEN.

Winter work ought to be in an advanced state. The roses will not want looking after. They should already have been pruned, and now any shoots which have a tendency to grow in wrong directions should be rubbed off. Overhaul the ferneries, and top-dress with a mixture of sandy loam and leaf mould, staking up some plants and thinning out others. Treat all classes of plants in the same manner as the roses where undesirable shoots appear. All such work as trimming lawns, digging beds, pruning, and planting should now be got well in hand. Plant out antirrhinums, pansies, hollyhocks, verbenas, petunias, &c., which were lately sown. Sow zinnias, amaranthus, balsam, chrysanthemum tricolour, marigold, cosmos, cockscombs, phloxes, sweet peas, lupins, &c. Plant gladiolus, tuberoses, amaryllis, pancratium, ismene, crinums, belladonna lily, and other bulbs. Put away dahlia roots in some warm moist spot, where they will start gently and be ready for planting out in August and September.

No time is now to be lost, for many kinds of plants need to be planted out early to have the opportunity of rooting and gathering strength in the cool, moist spring-time to prepare them for the trial of heat they must endure later on. Do not put your labour on poor soil. Raise only the best varieties of plants in the garden; it costs no more to raise good varieties than poor ones. Prune closely all the hybrid perpetual roses; and tie up, without pruning, to trellis or stakes the climbing and tea-scented varieties, if not already done. These and other shrubs may still be planted. See where a new tree or shrub can be planted; get these in position; then they will give you abundance of spring bloom. Renovate and make lawns, and plant all kinds of edging. Finish all pruning. Divide the roots of chrysanthemums, perennial phlox, and all other hardy clumps; and cuttings of all the summer bedding plants may be propagated.

Sow first lots, in small quantities, of hardy and half-hardy annuals, biennials, and perennials, some of which are better raised in boxes and transplanted into the open ground. Many of this class can, however, be successfully raised in the open if the weather is favourable. Antirrhinum, carnation, picotees, dianthus, hollyhock, larkspur, pansy, petunia, *phlox Drummondi*, stocks, wallflower, and zinnias, &c., may be sown either in boxes or open beds. Mignonette is best sown where it is intended to remain. Dahlia roots may be taken up and placed in a shady situation out of doors; plant bulbs such as anemones, ranunculus, fresias, snowflakes, ixias, watsonias, iris, narcissus, daffodil, &c. The Queenland climate is not suitable for tulips.

To grow these plants successfully it is only necessary to thoroughly dig the ground over to a depth of not less than 12 inches, and incorporate with it a good dressing of well-decayed manure, which is most effectively done by a second digging; the surface should be raked over smoothly so as to remove all stones and clods, thus reducing it to a fine tilth. The seed can then be sown in lines or patches as desired, the greatest care being taken not to cover deeply; a covering of not more than three times the diameter of larger seeds, and a light sprinkling of fine soil over small seeds, being all that is necessary. A slight mulching of well-decayed manure and a watering with a fine-rosed can will complete the operation. If the weather prove favourable, the young seedlings will usually make their appearance in a week or ten days; thin out so as to leave the plants (if in the border) at least 4 to 6 inches apart.

KITCHEN GARDEN.

Should showery weather be frequent during July, do not attempt to sow seeds on heavy land, as the latter will be liable to clog, and hence be injurious to the young plants as they come up. The soil should not be reworked until fine weather has lasted sufficiently long to make it friable. In fine weather get the ground ploughed or dug, and let it lie in the rough until required. If harrowed and pulverised before that time, the soil is deprived of the sweetening influences of the sun, rain, air, and frost. When the ground has been properly prepared, make full sowings of cabbage, carrot, broad beans, lettuce, parsnips, beans, radishes, leeks, spring onions, beetroot, eschalots, salsify, &c. As westerly winds may be expected, plenty of hoeing and watering will be required to ensure good crops. Pinch the tops of broad beans which are in flower and take up peas which require support. Plant out rhubarb, asparagus, and artichokes. In warm districts it will be quite safe to sow cucumbers, marrows, squashes, and melons during the last week of the month. In colder localities it is better to wait till the middle or end of August. Get the ground ready for sowing French beans and other spring crops.

The continued production of rhubarb may be greatly assisted by giving a heavy mulching of manure and hoeing it well into the soil. Keep the beds well watered, and give regularly a dressing of liquid manure, say, once a week.

It is not necessary to use forcing manures on the young stock, as plants are ruined if forced in the early stages of growth.

The rhubarb makes rapid growth during the autumn and spring, and when stalk cutting has been started liquid manuring and manuring may be given.

NOTES ON ROSE CULTURE.

The following notes on rose culture are taken from the Pacific Nurseries (Messrs. C. W. and A. C. Heers), Manly, Brisbane:—

Time for Planting.—From May until the end of September. For the coastal, excepting perhaps the Central and North, we specially recommend the later period, and, in support, advance the following reasons:—

Every horticulturist must admit that all roses, particularly in the coastal area of Queensland, invariably exhibit luxurious and succulent growth and wealth of bloom during the months of March, April, May, and early June. This being so, we contend that as the plants are full of flowing sap they are not in a fit condition for transplanting during that period. There are, however, odd seasons when plants ripen earlier. In such circumstances, we would not object to extra early planting, but consider May and June do not give the plants time to establish themselves sufficiently to withstand the approaching winter.

Roses planted during the earlier months readily respond to the warm periods which assuredly occur in the middle of our winter, only to be as surely struck by our colder and more frosty days during the latter part of the winter. This shock not only checks the growth, but actually kills the tender white jelly-like roots then in the forming. There can be only one result—a plant with stunted growth upon which the foundations of your future tree has to be built. Remember, if these plants are left undisturbed in the nursery they remain dormant.

On the other hand a thoroughly rested and ripened plant, transplanted during late July, August, or September, according to the trend of the season, is ready to break away into full and vigorous growth as the warmth of Spring appears, never to look back.

We readily admit that the rose, being a hardy plant, may even do well when planted early, but after much experience we prefer to pin our faith to late planting, in most parts of Queensland where our winter is so variable. Holding these views, we hope clients will follow our advice and plant late in the season, say, from the middle of July to the middle of September. However, from Rockhampton north, earlier planting may be preferable.

Roses planted during September and even October will do quite well; if planted this late they should, however, be provided with artificial shade and kept well watered until they are established.

It is gratifying to us to know that quite a number of clients, after acting upon our advice, write to say how pleased they are with their experience of late planting; so we reiterate—do not plant or prune roses too early in Queensland, especially along eastern slopes south of Bundaberg.

We must warn people that early planting is the cause of many failures, therefore, do not complain if you ignore our advice.

Selecting Varieties.—When making selections consult our brief descriptions and ascertain the variety's suitableness regarding its growth, style, colour, fragrance, and freedom of bloom. If you are not acquainted with the various varieties listed it will pay you to leave selection to us, mentioning any varieties you may already have. You will find a special list on the inside of the front cover, giving our choice in each colour.

Planting.—Roses should never be planted when the ground is sodden, as the soil glues together and excludes the air so necessary for the future welfare of the plant. Rather delay planting, and in the meantime bury the whole plant lengthwise, cover completely with soil and await more favourable conditions. It is surprising how long plants may be kept by this method.

Although roses do well under almost any condition, it will always repay you to trench and drain the ground. However, should the ground be flat and unsuitable for drainage, it is better to dig it a foot deep and raise the bed. Such beds require hardwood or concrete borders, otherwise the outside plants dry out too easily. Work in a liberal supply of well-rotted cow or stable manure. This work should be done at least four weeks prior to planting. Plant so that the union will be just under the surface of the ground. In the case of light sandy soil it is an advantage to have the union as much as 2 inches below the surface. Never, on any account, place fresh manure or any form of fertilizer near the roots at the time of planting.

The roots should be evenly spread and so arranged as to give them a downward tendency; cover with about 3 inches of fine soil and press down firmly; fill in and give a liberal supply of clean water. Keep the earth away from the graft until the plant strikes; in the meantime, mulch with straw in order to protect union and keep the soil from caking. Cover the outside edges of straw with soil to keep it in position.

The mulch also creates an ideal condition for further waterings. Should the weather continue dry, it will be necessary to water at intervals, according to the conditions. Do not use fresh manure or artificial fertiliser near the roots when planting. Should the sun's rays become hot after planting, it is advisable to provide the plant with artificial shade.

Suckers.—Always keep a sharp lookout for brier suckers, which may from time to time sprout from below the graft. These are readily detected by their foliage, and if not removed they will in time kill the rose tree. *However, on no account must any new rose growth from the base be interfered with.*

Manuring.—Roses should be heavily manured at least once a year, well-rotted animal manure being the best. It should be spread over the bed and lightly forked in. Bone dust and other suitable fertilizers are also beneficial. Established rose trees are greedy feeders, and periodical light dressings of fertilizer, applied during damp weather, will give good results. Heavy soil needs occasional dressings of lime, which, however, should not be used within a month or so of fertilizers.

Pruning.—There is no phase of rose culture more difficult to impart than that of pruning. After accepting the broad principles generally laid down, make a close study of the habits and peculiarities of the various types of roses. Apply commonsense methods and observe and profit by the results obtained. We are opposed to early pruning in this State for similar reasons to those advanced against early planting. However, varieties with H.P. strain may, if the canes are sufficiently ripened, be shortened during March or April to from 3 to 5 feet from the ground—the weaker the shorter. This will ensure a wealth of bloom in the late autumn. For the annual overhaul the end of July and August is the best time. Hard pruning, as practised in cold countries, must not be generally applied here. The reason is not far to seek, as the periods of inactivity are short and uncertain. Make the prevailing conditions your guide as to how and when to prune. Assist the pruning problem by observing the following golden rules during the entire season:—

(1) Cut away dead, spindle wood; (2) always cut blooms and stems that have bloomed well back to a strong eye; (3) never allow seed pods to form on the bush. By these means you will encourage correct growth and freedom of bloom. There are odd varieties which resent the knife, Penelope for instance.

It is most important that plants be kept free from scale and other diseases, otherwise valuable portions have to be prematurely removed to the detriment of the plant. Exhibitors should prune harder than those growing for general purposes. Tea roses require lighter treatment than H.T.'s and H.P.'s.

To prune, cut away all dead, diseased, and spindling wood; thin out anything that is liable to crowd; cut back shoots to a strong eye, pointing outward in the case of uprights and inward on those of spreading habits; preserve any new strong shoots coming from the base (often misnamed water shoots) that may serve to replace any worn-out stems that should be renewed every three years or so.

As soon as the new growth appears, carefully rub off any shoot that is likely to overcrowd or grow in a wrong direction.

Climbers should be allowed their fling during the time they are establishing themselves. Train the strongest canes horizontally, about 24 inches apart, shorten the ends, and cut away all other wood. Provide for the renewal of these trailers every few years.

Aphis.—Nicotine sprays, such as Black Leaf Forty, are most effective. They may be kept in check by applying the hose freely.

Scale.—Spray with either red oil, kerosene emulsion, or any lime-sulphur mixture. Many roses are lost annually through scale.

Grubs, &c.—For all leaf, plant, and flower eating insects, spray with arsenate of lead as directed.

Mildew.—This is a stubborn fungus disease that has for many years past baffled our scientists. The rose, like all other life, no doubt requires a properly balanced food, and as analyses show that our soils are often deficient in potash and lime, it is not altogether surprising to find that, where good dressings of wood ashes have been applied, appreciable improvement in reducing the mildew scourge is apparent. Experiments are being conducted all over the world in search for a cure for mildew, and reports to hand show that potash used in its various forms gives results which are at least reassuring. For our part we can say that we have found the use of wood ashes, also spent carbide, beneficial. If these are not available, try giving each established tree say 4 to 6 oz. of sulphate of potash, in addition to lime, and observe the result.

Regular sprayings with liver of sulphur (1 oz. to 2 gallons of water), or 1 oz. bicarbonate of soda to 1 gallon of water, or Bordeaux, will ward off attacks. Remedies: Flowers of sulphur, 9 parts; arsenate of lead, 1 part; well mixed; applied with a bellows when the dew is on the foliage. Sprays: Sulphuric acid, 1 part to 800 parts of rain water, 1 oz. bicarbonate of soda to 1 gallon of rain water is a helpful spray. A drastic remedy is 2 tablespoonfuls of lysol to 1 gallon of water. Spraying should be done before noon. Always treat the underneath as well as the top of the foliage.

Failures.—Failures are generally attributable to one or more of the following causes:—

Having used fresh manures or fertiliser at time of planting. Allowing roots to be exposed after unwrapping. Lack of drainage or planting in soggy ground through excessive wet weather. Planting too near the edge of raised beds, too near shrubs, trees, and/or hedges; also in shady positions. Allowing plants to dry out after westerlies. Giving too much water during first fourteen days in cold weather. Heavy frosts just after planting or even when the plant is established. Planting too deep, planting too shallow, or planting too loose. Acidity in damp or poorly prepared soils. Chemical reactions from fertilizers previously applied to the soil. Plants being knocked by children or the thoughtless gardener. Dogs and cats are often the cause of plants dying or being damaged. The use of strong soap suds, &c. Planting too early or too late. Planting in same spot where a rose has been growing unless soil has been replaced.

TOMATO SEED SELECTION.

In selecting tomatoes from which seed is to be saved, only that from the best yielding plants which conform strictly to the characteristics of the variety, both as regards type of vine and type of fruit, should be chosen. Several fruit should be cut open to be sure of the quality. A plant should be chosen that produces a large number of average size tomatoes rather than a plant with two or three large fruits and a number of small ones. Care should be taken to see that the plant is free from disease, as several tomato diseases are transmitted by the seeds.

The best method of separating tomato seed from the surrounding pulp is as follows:—Cut the fruit in halves and scoop the contents into a bucket, and when the latter is about half full, fill up with water. Stand the bucket aside and allow the contents to ferment, which will take from two to six days, according to the warmth of the weather. A froth forms on top of the water when fermentation is sufficiently advanced. Wash the contents of the bucket on a fine sieve or a layer of hessian and the pulp will come right away from the seed, which must be spread out in a thin layer to dry. Rapid drying is important to prevent moulding. When dry, rub the seed in the hands to separate the individual seeds. Seed harvested in this manner has averaged 94 per cent. germination.

As already indicated, selection from a plant which is free from disease is important, but as a further precaution the seeds should be dipped for ten minutes in a solution of mercuric chloride, 1 part in 1,000 parts of water, before planting. Proper precautions must be taken with mercuric chloride where there are children or animals, as it is highly poisonous if taken internally.

Orchard Notes for July.

THE COASTAL DISTRICTS.

THE marketing of citrus fruits will continue to occupy the attention of growers. The same care in the handling, grading, and packing of the fruit that has been so strongly insisted upon in these monthly notes must be continued if satisfactory returns are to be expected. Despite the advice that has been given over and over again, some growers still fail to grasp the importance of placing their fruit on the market in the best possible condition, and persist in marketing it ungraded; good, blemished, and inferior fruit being met with in the same case. This, to say the least, is very bad business, and as some growers will not take the necessary trouble to grade and pack properly, there is only one thing to do, and that is to insist on the observance of standards of quality and see that the fruit offered for sale complies with the standards prescribed, and that cases are marked accordingly.

Where the crop has been gathered, the trees may be given such winter pruning as may be necessary, such as the removal of broken or diseased limbs or branches, and the pruning of any superfluous wood from the centre of the tree. Where gumming of any kind is seen it should be at once attended to. If at the collar of the tree and attacking the main roots, the earth should be removed from around the trunk and main roots—all diseased wood, bark, and roots should be cut away, and the whole of the exposed parts painted with Bordeaux paste.

When treated, do not fill in the soil around the main roots, but allow them to be exposed to the air for some time, as this tends to check any further gumming. When the gum is on the trunk or main limbs of the tree cut away all diseased bark and wood till a healthy growth is met with, and cover the wounds with Bordeaux paste.

If the main limbs are infested with scale insects or attacked by any kind of moss, lichen, or fungus growth, they should be sprayed with lime sulphur.

Towards the end of the month all young trees should be carefully examined for the presence of elephant beetles, which, in addition to eating the leaves and young bark, lay their eggs in the fork of the tree. When the young hatch out they eat their way through to the wood and then work between the wood and the bark, eventually ringbarking one or more of the main limbs, or even the trunk. A dressing of strong lime sulphur to the trunk and fork of the tree, if applied before the beetles lay their eggs, will act as a preventive. In the warmer localities a careful watch should also be kept for the first appearance of any sucking bugs, and to destroy any that may be found. If this is done systematically by all growers the damage done by this pest will be very much reduced.

Citrus trees may be planted throughout the month. Take care to see that the work is done in accordance with the instructions given in the June notes. All worn-out trees should be taken out, provided the root system is too far gone to be renovated; but when the root system is still good the top of the tree should be removed till sound, healthy wood is met with, and the portion left should be painted with a strong solution of lime sulphur. If this is done the tree will make a clean, healthy growth in spring.

The inclusion of a wide range of varieties in citrus orchards—and which has been the general practice—is to be deprecated. Even in new plantations there is a tendency to follow the same unprofitable lines. Far too much consideration is given to the vendor's description for the purchaser's appreciation of a particular variety or varieties. Individual tastes must be subordinated to market requirements, and the selection of varieties to the best available kind of early, medium, and late fruits. Amongst oranges Joppa should be placed first, Sabina for early fruit, and Valencia or Loon Giru Gong for late markets.

In mandarins local conditions influence several varieties, and since the introduction of the fungus known as "scab" the inclusion, particularly on volcanic soil, of the Glen Retreat and Emperor types is risky. In alluvial lands, Emperor and Sovereign (an improved Glen Retreat) are the most profitable, though Scarlet in many places is worth including, with King of Siam as a late fruit.

Land intended for bananas and pineapples may be got ready, and existing plantations should be kept in a well-cultivated condition so as to retain moisture in the soil.

Bananas intended for Southern markets may be allowed to become fully developed, but not coloured, as they carry well during the colder months of the year, unless they meet with a very cold spell when passing through the New England district of New South Wales.

The winter crop of smoothleaf pines will commence to ripen towards the end of the month, and when free from blackheart (the result of a cold winter) or from fruitlet core rot, they are good for canning, as they are of firm texture and stand handling. Where there is any danger of frost or even of cold winds, it pays to cover pines and also the bunches of bananas. Bush hay is used for the former and sacking for the latter.

Strawberries should be plentiful during the month, provided the weather is suitable to their development, but if there is an insufficient rainfall, then irrigation is required to produce a crop. Strawberries, like all other fruits, pay well for careful handling, grading, and packing; well-packed boxes always realising a much higher price than indifferently packed ones on the local market. Where strawberries show signs of leaf blight or mildew, spray with Bordeaux mixture for the former and with sulphide of soda for the latter.

When custard apples fail to ripen when gathered, try the effect of placing them in the banana-ripening rooms, and they will soon soften instead of turning black.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

JULY is a busy month for the growers of deciduous fruits, as the important work of winter pruning should, if possible, be completed before the end of the month, so as to give plenty of time for spraying and getting the orchard into proper trim before the spring growth starts.

In pruning, follow the advice given in the May number; and if you are not thoroughly conversant with the work, get the advice of one of the Departmental officers stationed in the district.

Pruning is one of the most important orchard operations, as the following and succeeding seasons' crops depend very largely on the manner in which it is carried out. It regulates the growth as well as the number and size of the fruit, as if too much bearing wood is left there is a chance of the tree setting many more fruits than it can properly mature, with a result that unless it is rigorously thinned out it is under-sized and unsaleable. On the other hand, it is not advisable to unduly reduce the quantity of bearing wood, or a small crop of overgrown fruit may be the result.

Apples, pears, and European varieties of plums produce their fruits on spurs that are formed on wood of two years' growth or more; apricots and Japanese plums on new growth and on spurs; but peaches and nectarines always on wood of the previous season's growth. Once peachwood has fruited it will not produce any more from the same season's wood, though it may develop spurs having a new growth or new laterals which will produce fruit.

The pruning of the peaches and nectarines, therefore, necessitates the leaving of sufficient new wood on the tree each season to carry a full crop, as well as the leaving of buds from which to grow new wood for the succeeding year's crop. In other words, one not only prunes for the immediately succeeding crop, but also for that of the following season.

All prunings should be gathered and burnt, as any disease that may be on the wood is thoroughly destroyed. When pruned, the trees are ready for their winter spraying with lime sulphur.

All kinds of deciduous trees may be planted during the month provided the ground is in a proper state to plant them. If not, it is better to delay planting until August, and carry out the necessary work in the interval. The preparation of new land for planting may be continued, although it is somewhat late in the season, as new land is always the better for being given a chance to mellow and sweeten before being planted. Do not prune vines yet on the Granite Belt; they can, however, be pruned on the Downs and in the western districts.

Trees of all kinds, including citrus, can also be planted in suitable situations on the Downs and western districts, and the pruning of deciduous trees should be concluded there. If the winter has been very dry, and the soil is badly in need of moisture, all orchards in the western districts, after being pruned and ploughed, should receive a thorough irrigation (where water is available) about the end of the month, so as to provide moisture for the use of the trees when they start growth. Irrigation should be followed by a thorough cultivation of the land to conserve the water so applied. As frequently mentioned in these notes, irrigation and cultivation must go hand in hand if the best results are to be obtained, especially in our hot and dry districts.

Farm Notes for July.

FIELD.—Practically the whole of the work on the land for this month will be confined to the cultivation of winter crops, which should be now making good growth, and to the preparation of land for the large variety of crops which can be sown next month. Early-maturing varieties of wheat may be sown this month. The harvesting of late-sown maize will be nearing completion, and all old stalks should be ploughed in and allowed to rot. Clean up all headlands of weeds and rubbish, and for this purpose nothing equals a good fire. Mangels, swedes, and other root crops should be now well away, and should be ready for thinning out. Frosts, which can be expected almost for a certainty this month, will do much towards ridding the land of insect pests and checking weed growth. Cotton-picking should be now practically finished and the land under preparation for the next crop. The young lucerne should be becoming well established; the first cutting should be made before the plants flower—in fact, as soon as they are strong enough to stand the mowing machine—and the cutting of subsequent crops should be as frequent as the growth and development of the lucerne plants permit. Ordinarily cutting should be regulated to fit in with the early-flowering period—i.e., when about one-third of the plants in the crop are in flower.

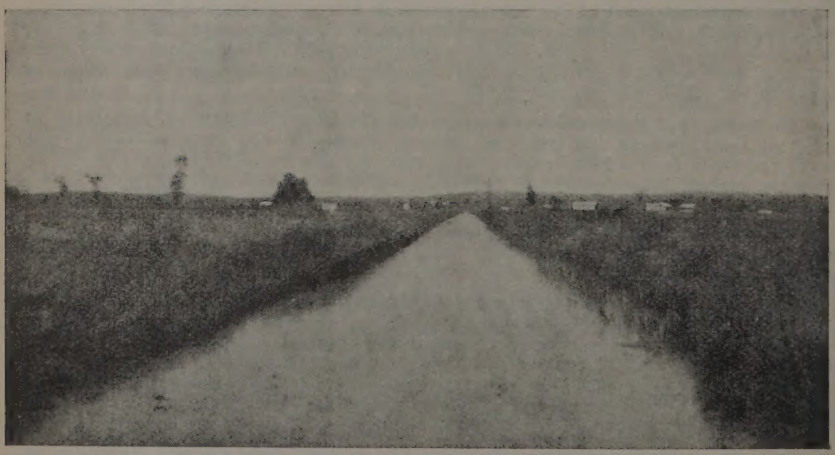


PLATE 171.
A main channel, Theodore Irrigation Settlement, Queensland.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF APRIL, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING APRIL, 1934, AND 1933, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Apr.	No. of Years' Records.	Apr., 1934.	Apr., 1933.		Apr.	No. of Years' Records.	Apr., 1934.	Apr., 1933.
North Coast.	In.		In.	In.	*Central Highlands.*	In.		In.	In.
Atherton	4·29	33	6·05	11·35	Clermont	1·65	63	0·68	1·88
Cairns	11·52	52	13·38	18·63	Gindie	1·25	35	0·14	2·90
Cardwell	8·87	62	11·16	9·09	Springsure	1·59	65	1·75	0·78
Cooktown	8·75	58	12·86	16·86					
Herberton	3·89	48	4·39	6·98					
Ingham	7·82	42	4·19	3·01					
Innisfail	19·94	53	39·35	24·19					
Mossman Mill ..	8·77	21	4·42	22·19	*Darling Downs.*				
Townsville	3·47	63	1·69	5·61					
Central Coast.					Dalby	1·40	64	3·33	1·24
					Emu Vale	1·39	38	3·90	2·00
Ayr	2·56	47	1·03	2·76	Hermitage	1·46	28	2·72	1·82
Bowen	2·78	63	0·81	2·74	Jimbour	1·38	46	3·58	1·07
Charters Towers ..	1·54	52	1·09	0·55	Miles	1·49	49	2·42	1·87
Mackay	6·37	63	3·02	4·61	Stanthorpe	1·76	61	4·69	1·57
Proserpine	5·90	31	4·39	5·95	Toowoomba ..	2·60	62	6·28	3·68
St. Lawrence ..	2·85	63	2·05	1·97	Warwick	1·67	69	2·36	1·81
South Coast.									
					Maranoa.				
Biggenden	2·19	35	4·55	3·69					
Bundaberg	3·12	51	11·91	5·83	Roma	1·35	60	0·78	0·89
Brisbane	3·86	83	6·33	8·95					
Caboolture	4·41	47	16·19	8·85					
Childers	2·85	39	6·13	3·50					
Crohamhurst	6·74	41	15·90	12·61					
Esk	3·10	47	3·91	4·98					
Gayndah	1·48	63	2·05	2·92					
Gympie	3·43	64	9·07	3·47	*State Farms, &c*				
Kilkivan	2·28	55	4·94	2·42					
Maryborough ..	3·78	63	10·12	3·65	Bungeworgorai ..	1·28	20	0 72	1·15
Nambour	6·30	38	10·62	11·98	Gatton College ..	1·89	35	..	1·91
Nanango	1·98	52	3·67	2·24	Kairi	4·11	20	..	10·74
Rockhampton ..	2·61	63	3·00	1·57	Mackay Sugar Experiment Station	4·95	37	2·57	4·40
Woodford	4·71	47	9·32	14·32					

GEORGE G. BOND, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—APRIL, 1934.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.		Deg.		Deg.		Points.	
Cooktown	29·82	85	73	89	9	69	5	1,286	14
Herberton	..	76	61	84	6	53	16	439	15
Rockhampton	29·97	83	66	90	16	55	24	300	11
Brisbane	30·05	78	62	86	19	50	24	633	16
Darling Downs.									
Dalby	30·03	79	54	89	18	36	24	333	8
Stanthorpe	..	70	49	81	8	21	24	469	11
Toowoomba	..	72	53	82	19	33	24	628	14
Mid-interior.									
Georgetown	29·85	90	66	97	2	56	15, 16	90	6
Longreach	29·96	89	62	97	6,7,8	50	23, 25	115	2
Mitchell	30·03	81	52	91	18	33	24, 25	36	3
Western.									
Burketown	29·86	93	72	102	8	64	27	53	2
Boulia	29·96	88	63	100	6, 7	47	25	15	1
Thargomindah	30·03	80	59	93	5	42	29	86	2

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	June, 1934.		July, 1934.		MOONRISE. June, 1934.	July, 1934.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	6·37	5·2	6·45	5·7	8·33	9·38
2	6·37	5·2	6·45	5·7	9·42	10·40
3	6·38	5·2	6·45	5·7	10·47	11·41
4	6·38	5·2	6·45	5·8	11·49	a.m.
5	6·39	5·2	6·45	5·8	a.m.	12·40
6	6·39	5·2	6·45	5·8	12·51	1·40
7	6·39	5·2	6·45	5·9	1·49	2·39
8	6·40	5·2	6·45	5·9	2·47	3·36
9	6·40	5·3	6·44	5·9	3·48	4·31
10	6·40	5·3	6·44	5·10	4·47	5·24
11	6·40	5·3	6·44	5·10	5·43	6·12
12	6·40	5·3	6·44	5·10	6·38	6·57
13	6·41	5·3	6·44	5·11	7·30	7·35
14	6·41	5·3	6·44	5·11	8·18	8·9
15	6·41	5·3	6·44	5·12	9·1	8·39
16	6·41	5·3	6·43	5·12	9·37	9·10
17	6·42	5·4	6·43	5·13	10·10	9·35
18	6·42	5·4	6·43	5·13	10·39	10·5
19	6·42	5·4	6·42	5·14	11·8	10·36
20	6·42	5·4	6·42	5·14	11·37	11·8
					p.m.	
21	6·43	5·4	6·41	5·15	12·8	11·47
						p.m.
22	6·43	5·4	6·41	5·15	12·40	12·34
23	6·43	5·4	6·40	5·16	1·16	1·30
24	6·44	5·4	6·40	5·16	1·58	2·35
25	6·44	5·5	6·39	5·17	2·51	3·44
26	6·44	5·5	6·39	5·17	3·54	4·55
27	6·44	5·5	6·38	5·18	5·2	6·9
28	6·44	5·5	6·38	5·18	6·12	7·18
29	6.44	5.6	6·37	5·19	7·24	8·24
30	6·44	5·6	6·37	5·19	8·34	9·27
31	..	..	6·36	5·20	..	10·29

Phases of the Moon, Occultations, &c.

4 June	☽ Last Quarter	10	53 p.m.
12 ,,	● New Moon	12	11 p.m.
20 ,,	☾ First Quarter	4	37 p.m.
27 ,,	○ Full Moon	3	8 p.m.

Apogee, 15th June, at 8.18 p.m.
Perigee, 28th June, at 10.54 a.m.

Venus, not nearly so brilliant as in January, will be conspicuous near the border of Pisces and Aries.

In the early mornings of the first three or four days of June the apparent nearness of Venus and Uranus, separated by little more than three diameters of the Moon on the 2nd, will form an interesting object for observers with telescopes.

Saturn, near the border of Capricornus and Aquarius, will be only 3 degrees south of the Moon when it rises at 10.47 p.m. on the 3rd.

Always an interesting object in a telescope, it will be coming into view late at night, rising at 10.49 p.m. on the 1st and at 9.54 p.m. on the 15th. Its unique ring-system has been closing in for the last six years, so that it will be far from at its best; but about one-third of its northern side may still be seen.

The Moon will be passing from west to east of Mars at 9 p.m. on the 11th, but the Sun, being only 14 degrees further east, and there being an interval of only 27 hours till new Moon, no observations will be generally practicable.

Jupiter, in Virgo, which had seemed to be moving westward since 20th February, will become stationary on 11th June, and afterwards continue its normal eastward direction till the end of the year. It will be the principal evening star during the month, remaining almost in the same spot in Virgo.

Mercury will reach its greatest elongation, 24 degrees east of the Sun on the 14th, and remain above the horizon for about one hour and three-quarters after sunset, being then very near the place in Gemini where Pluto was discovered four and a-half years ago, in the neighbourhood of Delta Geminorum, a star of magnitude 3½. Observers will find this an easy and interesting object. At 5 o'clock in the afternoon of the 14th the crescent-shaped Moon will be only one degree north of Mercury.

On the 22nd Jupiter will be passed by the Moon at 2 a.m.; the planet then being 7 degrees (one degree more than the length of the Cross) north of it.

An interesting occultation of Antares, the principal star of Scorpio, should be looked for about 9 p.m. on the 25th, when the Moon and the star will be very nearly overhead at Brisbane, Toowoomba, and Warwick.

4 July.	☽ Last Quarter	6	28 a.m.
12 ,,	● New Moon	3	6 a.m.
20 ,,	☾ First Quarter	4	53 a.m.
26 ,,	○ Full Moon	10	9 p.m.

Apogee, 13th July at 4.12 a.m.
Perigee, 26th July at 8.18 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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